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Abstract

Indonesian forest and peat fires have become global concern. Not only the fires have caused regional environmental and humanitarian crises, they also have exacerbated global climate change. Radical and rapid land use change couple with irresponsible practice of clearing land through burning are key contributing factors. In response, the Indonesian government issued a strict ban on the practice. While this policy outcome continues to shortfall, it implicates traditional farmers whose subsistence depends on such a practice. This reality necessitates effort to develop a more nuanced and targeted intervention. Thus, this study examines individual's intention to clear land using fire. We surveyed 151 Indonesian traditional farmers based on the Theory of Planned Behavior (TPB), the Norm Activation Model (NAM) and past behavior. We identified the TPB, which is augmented by the past behavior and awareness of consequences, as the optimal model for explaining variance in the intention. Implications for developing more effective educational campaigns are discussed.

Keywords	Burning, Theory of Planned Behavior, Norm Activation Model, Forest Management, Forest and peat fires

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Data for: Toward A Nuanced and Targeted Fire Prevention Policy: Insight from Psychology

These supplementary materials consist of response data that were used in the study and dummy questionnaire that was revised after being piloted.

Highlights:

- All variables of the Theory of Planned Behaviour, past burning behaviour, and awareness of consequences explained a considerable proportion of variance in burning intention.
- Attitudes and Subjective Norms mediated the relationship between Awareness of Consequence and burning intention.
- Awareness of Consequence and Responsibility Denial predicted Personal Norms, but Personal Norms did not predict burning intention.

Abstract

Indonesian forest and peat fires have become global concern. Not only the fires have caused regional environmental and humanitarian crises, they also have exacerbated global climate change. Radical and rapid land use change couple with irresponsible practice of clearing land through burning are key contributing factors. In response, the Indonesian government issued a strict ban on the practice. While this policy outcome continues to shortfall, it implicates traditional farmers whose subsistence depends on such a practice. This reality necessitates effort to develop a more nuanced and targeted intervention. Thus, this study examines individual's intention to clear land using fire. We surveyed 151 Indonesian traditional farmers based on the Theory of Planned Behavior (TPB), the Norm Activation Model (NAM) and past behavior. We identified the TPB, which is augmented by the past behavior and awareness of consequences, as the optimal model for explaining variance in the intention. Implications for developing more effective educational campaigns are discussed.

Keywords: Burning, Theory of Planned Behavior, Norm Activation Model, Forest Management, Forest and peat fires

Toward A Nuanced and Targeted Fire Prevention Policy: Insight from Psychology

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1. Introduction

Between September and October 2019, thick haze blanketed a large part of Indonesia and its neighboring countries (e.g., Malaysia and Singapore) (Reuters 2019). This haze is brought about by raging fires that smoldered in Indonesian forests and peat. Millions of people in Indonesia, Singapore, and Malaysia were a risk of severe respiratory infection as Air Quality Index (AQI) spanned from 150 to over 350 (Greenpeace Southeast Asia 2019). These figures fall within the AQI categories of 'very unhealthy' to 'beyond hazardous'. Such a public health nightmare led to a temporary closure of thousands of schools in the respective countries (BBC News 2019; Jong 2019a).

Noxious haze in 2019 also disrupted business and tourism activities in the three countries. A number of flights had to be cancelled, delayed, and diverted due to an extremely poor visibility (The Straits Times 2019). Revenue from tourism experienced a significant decrease as both local and foreign tourists were reluctant to visit haze affected areas (Chin 2019).

The 2019 fires also affected the global environment. In November 2019, it is estimated that burning Indonesian forests emitted ~700 million tons of CO_2 (Rusmana 2019). Not only does this figure exceed Canada's annual carbon emissions, it is also 22% higher than the emissions from Amazonian fires during the same period (Rusmana 2019). With such a significant volume of emissions, the Indonesian fires could impede the realization of Paris agreement, to which Indonesia is a signatory (Jong 2019b).

While the 2019 Indonesian fires are very concerning, they are nothing new. Indonesia has grappled with forest and peat fires since the 1990s (Dennis 1999). Research suggests that the problem is rooted in the irresponsible practice of clearing land with fire (Tacconi 2016; Wijedasa et al. 2017). Multiple stakeholders, ranging from small-scale farmers to large

agribusiness corporations, use fire to prepare cash crop plantations (e.g., palm oil) in fragmented and degraded forest (Cattau et al. 2016; Gaveau et al. 2017). As a result, fire often escapes the intended boundaries and spreads out uncontrollably.

The Indonesian government has pursued a series of measures to prevent future fires (Jefferson et al. 2020). For example, in 2015, the government introduced a strict ban on any use of fire for land clearing (Thung 2018). In many cases, offenders receive fines or jail time. For traditional farmers, however, the banning of fire for land clearing may undermine their livelihood and food security.

For millennia, fire has been an integral part of subsistence farming within Indonesian traditional farmers (MacKinnon et al. 2013; Padoch et al. 2007). These farmers have used fire to clear small plots of farmland from felled vegetation, dangerous weeds, and pests (Henley 2011). They have also used fire to generate natural fertilizer in the form of ashes and to reduce peat land's acidity (Fox 2000). Yet, this local reality is not incorporated into the national ban (Jefferson et al. 2020). As such, traditional farmers on mineral and peat soils are relevant to defining policy responses to peat and land fires, even when they are not the agents of the peat fires themselves. Distinguishing between stakeholders and their practices of fire use and management could help to inform more targeted and nuanced policy responses and avoid the harms created by prohibitive responses and blanket bans (Carmenta, Coudel, and Steward 2018; Cramb et al. 2009; Thung 2018)

Distinguishing stakeholders is especially paramount given that the Indonesian government always ascribes responsibility to local communities (Meehan, Tacconi, and Budiningsih 2019). Fire tends to be associated with a lack of community knowledge and/or failure to react once it happens. Recently, a village-level incentive scheme, run by

agribusinesses and pulp-paper companies tend to put an extra burden on subsistence farmers (Watts et al. 2019). While participating villages receive funding, local farmers are forced to cease their subsistence farming. Thus, the scheme is rather an extension of the fire ban. Together with local governments and law enforcement agencies, the scheme focuses on "the dissemination of information on the sanctions for non-compliance" (Watts et al. 2019:10).

To understand the practice of clearing land through burning at local level, this study examines psychological mechanisms underlying individuals' intention to perform the practice. We employ three theoretical psychological models to examine the factors that motivate the intention. These models are the Theory of Planned Behavior (TPB), Norm Activation Model (NAM), and a hybridized model of the two. For purposes of identification and differentiation, the intention to clear land using fire is hereafter referred to as 'burning intention' and the actual practice is referred to as 'burning behavior'. We believe that studying the psychological factors underpinning burning intentions and burning behaviors among subsistence farmers will prove useful in helping to develop more nuanced and effective policies designed to prevent future forest and peat fires.

1.1. Theory of Planned Behavior (TPB)

The TPB posits that a person's intention to behave in a particular way is the most proximal determinant of a given behavior. Behavioral intention, in turn, is shaped by: (1) attitudes toward the behavior (ATB); (2) perceived subjective norms (SN); and (3) perceived behavioral control (PBC). Designed from a 'rational choice' perspective—where people act to maximize personal utility—ATB are theorized to stem from an assessment of whether

personal outcomes from performing a behavior will be personally beneficial or detrimental. SN are typically operationalized as a combination of: (a) an individual's beliefs about whether significant others would like him/her to act in an attitude-consistent way; and (b) his/her motivations to comply with significant others' expectations. PBC is an individual's perception of his/her ability, opportunity, and motivation to engage in attitude-consistent behavior and to control the behavioral outcomes.

Many studies have used the TPB as a framework for explaining various types of environmentally significant behavior, such as transport choice (e.g., cycling, walking) and consumption practices (e.g., recycling, purchasing sustainable apparel) (Ayob, Low, and Jalil 2017; Chang and Watchravesringkan 2018; Mahmud and Osman 2010). Due to the environmental consequences associated with the practice, burning behavior can be categorized as environmentally significant behavior and thus the TPB should be a useful framework for understanding this behavior. Indeed, several studies have already utilized the TPB to model burning intentions. For example, Bright and Burtz (2006) suggest that subjective norms correlate significantly with burning intention. In another example, Bates, Quick and Kloss (2009) describe perceived behavioral control as having a significant impact on the intention.

While revealing partial support for the TPB as a model of burning intention, the existing studies also raise questions about the sufficiency of the basic model in this behavioral context. Prior research indicates that adding predictors, such as past behavior, can improve the explanatory power of the TPB (Gifford and Nilsson 2014). This study, therefore, incorporates an individual's engagement with the practice of clearing land with fire in the past, hereafter referred to as 'past burning behavior' (PBB).

In sum, the TPB, as a model of planned action, is an established framework for explaining the deliberative and self-serving motivations that may underpin a person's behavioral intentions. While evidence for the TPB's ability to explain burning intention remains inconclusive, it provides a sound theoretical lens for investigating peoples' intentions to engage in this practice in Indonesia.

1.2. Norm Activation Model (NAM)

In the current study, we also investigate the NAM's sufficiency as a model of burning intention. According to the NAM, pro-social behavioral intentions tend to be primed when a person's moral or personal norms (PN) become active. PN are, in essence, personal commitments derived from internalized normative values and are experienced as feelings of moral obligation to act in a particular way (Schwartz 1977; Schwartz and Howard 1981). For PN to become active—and hence exert influence on behavior—two conditions must be met. An individual must be aware of the negative consequences of a given behavior for others and/or the environment (awareness of consequences; AC); and s/he must accept some personal responsibility for causing those negative consequences. In other words, the NAM asserts that it is an awareness of consequences (AC) combined with the absence of responsibility denial (RD) that activates PN, which in turn motivates people's intention to act in a morally consistent way.

While originally developed as a theoretical framework for understanding altruism, the NAM has been used more widely to look at environmentally significant behaviors, including in relation to some forms of burning behavior. For example, Van Liere and Dunlap (1978) demonstrated that awareness of consequences and responsibility denial shaped people's intention to burn household waste in backyards. This finding served as evidence

that personal norms were activated and influenced by the relationships between an individual's awareness of the consequences, sense of personal responsibility, and burning intention.

In sum, the NAM is another theoretical model that is commonly utilized to understand environmentally significantly behavior, and one which has been used previously in relation to burning behavior. On these grounds we believe that the NAM could prove useful in modeling burning intentions among our intended target population.

1.3. The Hybridized Model

In addition to individual applications of the TPB and the NAM, there are attempts to develop and test hybridized models that draw simultaneously upon the constructs of both models (see Abrahamse and Steg 2009; Cordano, Welcomer, Scherer, Pradenas, and Parada 2011; Zhang et al. 2018, for further review). Such a hybridization of rational choice and pro-social models is perhaps logical as environmentally significant behaviors are arguably derived from a mixture of self-interest and pro-social motives (see Bamberg and Möser 2007, for a review). Furthermore, research shows that the incorporation of pro-social constructs (e.g., moral norms) into the TPB can increase its explanatory power for certain environmentally significant behaviors by up to 10% (Harland, Staats, and Wilke 1999).

We argue that a hybridized model might be superior in explaining burning intention, relative to either the TPB or the NAM. This is because subsistence farmers are likely contending with dual pressures: the need to meet their personal interests (e.g., maintaining

their livelihood), and to abide the top-down, environmentally-grounded public policy. A core focus of the current study is, thus, to generate and test a hybrid model of burning intention, that combines the core principles of the TPB and the NAM alongside past burning behavior (PBB).

2. Method

2.1. Participants and recruitment

While multiple groups of actors are guilty of using burning behavior in Indonesia (including oil palm concessionaires and agribusiness), we focus on small-scale peat- and mineral-soil[1] subsistence farmers residing in four villages in Central Kalimantan and Riau provinces, Indonesia. These provinces are selected as they have experienced extensive forest and peat fires in recent years (Harris et al. 2015; Sloan et al. 2017). We employed a purposive sampling technique and snowball sampling to target prospective participants. We approached participants and asked whether they have engaged in burning behavior. If so, we then asked whether they would be willing to participate in the study and to identify other potential participants.

A total of 151 questionnaires were completed following visits to 180 homes (84% response rate). The final cohort of participants consisted of 124 Males (82.1%) and 27

[1] Although most of the escape fires were born from peat soil farming, we did not find any direct influence of different soil types on burning intention.

Females (17.9%), whose ages range from 18 to 75 years (M = 38.39, SD = 14.00). Regarding education level, 3% of the sample had never been to primary school, 37% had completed primary education, 23% had completed junior high school, 31% had graduated from senior high school, and 6% had a college degree. Ethical approval was obtained from Psychology Department, Lancaster University, UK, and Center for International Forestry Research (CIFOR), Indonesia.

2.2. Procedure

We approached prospective participants at their homes and gave them an information sheet containing an explanation about the nature of this study, their role in the study, and the contact details of the lead author (Note: all information is provided in Indonesian). We informed them that the study is designed to understand their experiences of, and reasons for, engaging in burning behavior. To participate, we required participants to be at least 18 years old. After consenting to participate in this study, participants were presented with a paper-based questionnaire written in Indonesian. The questionnaire comprised the key components of the TPB and the NAM, and past burning behavior. We also included basic demographic questions, such as sex, age, and educational attainment. After completing the survey, participants were fully debriefed and given a small monetary payment (Rp 100,000 or equivalent to ~£ 5) as a gesture of thanks for their time.

2.3. Measures

All measures outlined below utilized a five-point Likert-scale, ranging from 1 (strongly disagree) to 5 (strongly agree), unless otherwise stated. Items relating to the core explanatory variables were created by adapting those from cognate studies. The measures were piloted on an opportunity sample of 72 undergraduate students (studying at a

university in Banjarmasin, South Kalimantan, Indonesia) before use with our target population. Pilot participants completed the measures and provided qualitative feedback to the research team. The measures were then modified, as appropriate, based on feedback from this piloting activity.

2.3.1. Awareness of consequences (AC)

Eight-items (adapted after De Groot and Steg 2009; Hine, Marks, Nachreiner, Gifford, and Heights 2007; Onwezen at al. 2013; Steg and de Groot 2010) registered respondents' awareness of the negative implications of burning behavior (e.g., "Smoke from the burning land poses threat to young children in my neighborhood", and "Burning the land can effectively clean the land from destructive weeds and insects" (reverse coded)). Responses from these 8 items were averaged to generate a composite index of awareness of consequence (α = .83).

2.3.2. Responsibility Denial (RD)

Three-items (adapted after Onwezen et al., 2013; Van Liere & Dunlap, 1978) assessed respondents' denial of responsibility for causing the negative consequences of burning behavior (e.g., "I do not directly feel responsible for the impact of using fire for land clearance" and "I must take responsibility for the impact of using fire for land clearance" (reverse coded)). Responses from these items were averaged to generate a composite index of responsibility denial (α = .52). This index was rather an improved one. We calculated Cronbach's alphas using the 'scale if item deleted' option and removed two items that did not improve the scale (i.e., "The Government must take responsibility for the impact of using fire for land clearance because they do not provide me with other alternative" and "Using fire

for land clearance should be allowed because there is no other way to clear land from destructive weeds, insects and to generate nutrient for the soil").

2.3.3. Personal norms (PN)

Three-items (adapted after Harland, Staats & Wilke, 1999; Onwezen et al., 2013) assessed respondents' sense of normative moral pressure to cease burning behavior (i.e., "I feel a moral obligation to protect the forest", "I do not feel morally obliged to stop clearing land with fire" (reverse coded) and "I feel guilty when I clear land using fire"). Responses to the questions were averaged to create a composite index of personal norms (α = .45). We tried to increase this index value by removing one or two items from the PN scale only resulted in even lower alpha value. In addition, excluding two items from the measure will result in a single-item measure. Using a single-item measure is a risky decision in most empirical settings (Diamantopoulos et al. 2012).

2.3.4. Attitudes toward burning behavior (ATB)

Five-items (adapted after Harland, Staats & Wilke, 1999) assessed respondents' overall positive or negative beliefs about toward burning behavior (e.g., "In general using fire to clear land is good" and "In general using fire to clear land is bad" (reversed coded)). The responses were averaged to form a composite index of attitudes toward burning behavior (α = .74).

2.3.5. Subjective norms (SN)

Four-items (adapted after Ajzen & Fishbein, 1980) assessed participants' perceptions of social support (or opposition) for engaging in burning behavior (e.g., "My family supports my decision to clear land using fire" and "My fellow farmers do not support my decision to

clear land using fire" (reversed coded)). The responses were averaged to yield in a composite index of subjective norms (α = .86).

2.3.6. Perceived behavioral control (PBC)

Five-items (adapted after Clement et al., 2014; Ajzen & Madden, 1986) assessed respondents' confidence in their abilities to engage in burning behavior (e.g., "If I want, I can clear the land with fire when the cropping season is about to come" and "For me, clearing land with fire is not easy" (reverse coded)). Answers to the questions were then averaged to form a composite index of perceived behavioral control (α = .66). Similar to the case of RD, the index is an enhanced one. We calculated Cronbach's alphas using the 'scale if item deleted' option and took out two items that did not improve the scaleb (i.e., "I have the freedom to stop burning the land" and "For me, stop burning the land is easy") to increase the scale reliability of the measure of perceived behavioral control.

2.3.7. Burning intention (BI)

Respondents' intentions to engage in burning behavior were assessed using two items (adapted after Ajzen & Madden, 1986) (i.e., "I intend to use fire for clearing land" and "I do not intend to use fire for clearing land" (reverse coded)). The averaged responses led to a composite index of burning intentions (α = .72).

2.3.8. Past burning behavior (PBB)

A single item (adapted after Harland, Staats & Wilke, 1999) assessed respondents' past burning behavior (i.e., "Over the past three years, how frequently have you used fire for clearing land?"). Response options to this question range from 1 (never) to 5 (always).

3. Results

In general, our hierarchical regression indicates the potentials of hybridized model for explaining burning behavior within our sample. In particular, awareness or consequences, attitudes toward burning behavior, perceived behavioral control, subjective norms, and past burning behavior were found to be the underlying factors of burning intention. Our findings are summarized in the table 1. We also examined correlations of the TPB, the NAM, and the Demographic variables along with burning intention and past burning behavior (see table 2).

Table 1. Summary of hierarchical regression analysis for variables predicting burning intentions (N = 151)

	TPB		TPB & PBB		NAM		Hybrid Model	
Variables	β	t	β	t	β	t	β	t

ATB	.34**	.34**	-	.32**	
	4.26	4.28		3.51	
PBC	.21**	.20**	-	.17*	2.28
	2.79	2.67			
SN	.22**	.18*	-	.22**	
	2.66	2.28		2.75	
PBB	-	.17**	-	.19**	
		2.63		2.92	
AC	-	-	-.33**	-.01	-
			-4.09	.11	
RD	-	-	-.13	-	
			-1.05		
PN	-	-	-.08	-	
			-.96		
Age	-	-	-	.16*	2.44
Adjusted	.38	.40	.11	.42	
R^2					
F	31.19**	26.06**	7.01	18.85**	

*Note: *p <.05;**p < .01; ATB= Attitudes Toward Burning Behavior, PBC= Perceived Behavioral Control; SN= Subjective Norms; PBB= Past Burning Behavior; AC= Awareness of Consequence; RD= Responsibility Denial; PN= Personal Norms*

Table 2. Correlations among variables

		1	2	3	4	5	6	7	8	9	10	11
1	AC											
2	ATB	-.60**										
3	RD	-.11	.12									
4	PBC	-.19*	.46**	.17*								
5	Education	-.02	.14	-.02	.1							
6	Sex	.04	.1	-.08	.09	.13						
7	Age	.15	-.02	.03	.07	-.06	.07					
8	PBB	-.24**	.18*	-.15	.18*	.14	.15	-.16*				

9	BI	-.33**	.55**	-.05	.45**	.1	.17*	.09	.31**		
10	SN	-.35**	.54**	.17*	.42**	.07	.07	-.18*	.26**	.49**	
11	PN	.25**	-.26**	-.43**	-.21**	-.05	.1	.19*	-.06	-.11	-.34**

*Note. N= 151. *p < .05; **p < .01*

3.1. Demographic variables

A multiple regression analysis was conducted to examine whether burning intentions are significantly predicted by three demographic (control) variables (i.e., age, sex and educational level). Controlling for all predictors in TPB, NAM and PBB, the results showed that age predicts burning intentions, $\beta = .16$, $t(140) = 2.38$, $p < .05$, whereas sex, $\beta = .06$, $t(140) = 1.00$, $p = .32$, educational level, $\beta = .00$, $t(140) = .06$, $p = .95$, do not. This might relate to the fact that burning behavior is more ingrained within older farmers and that their children are less invested in the behavior.

3.2. TPB and PBB

A hierarchical-multiple regression analysis with a stepwise selection was performed to examine whether all variables of TPB and PBB predict burning intention. In step 1, ATB, PBC, and SN were entered into the equation as independent variables. The results showed that all predictors in TPB explain a significant proportion of variance in burning intention (39%), adjusted $R^2 = .38$, $F(3, 147) = 31.19$, $p < .01$. Specifically, ATB, $\beta = .34$, $t(147) = 4.26$, $p < .01$, PBC, $\beta = .21$, $t(147) = 2.79$, $p < .01$, and SN, $\beta = .22$, $t(147) = 2.66$, $p < .01$. PBB was then included in step 2. The proportion of variance in burning intention increased to 42%, adjusted $R^2 = .40$, $F(4, 146) = 26.06$, $p < .01$, and the increase was significant, $F(1, 146) = 6.91$, $p < .01$. PBB was found to be a positive predictor of burning intention, $\beta = .17$, $t(146) = 2.63$, $p < .01$. These findings support the application of TPB to explain burning intention in the current research context.

3.3. NAM

Results from a multiple regression showed that AC, β = .21, t(148) = 2.84, p < .01, and RD, β = -.40, t(148) = -5.53, p < .01, predict PN. Another multiple regression analysis showed that these variables explain a significant proportion of variance in burning intention (13%), adjusted R2 = .11, F(3, 147) = 7.01, p < .01. AC negatively predicts burning intention when RD and PN are controlled for, β = -.33, t(147) = -4.09, p < .01. However, RD does not predict burning intention when AC and PN are controlled for, β = -.13, t(147) = -1.50, p = .14. PN does not predict burning intention when AC and RD are controlled for, β = -.08, t(147) = -.96, p = .342. This finding indicated that PN is not a significant mediator of the relationship between AC, RD and burning intention.

3.4. Hybrid model

Since prior analyses confirmed AC and all constructs in TPB (plus PBB) significantly predict burning intentions, we then entered these variables, into a single model as independent variables. Age was included as a control variable in the model because it was found to be a significant predictor of burning intention in the demographic regression analysis. The regression model explained 44% of the variance in burning intention, adjusted R^2 = .42, F(6, 144) = 18.85, p < .01. ATB, β = .32, t(144) = 3.51, p < .01, PBC, β = .17, t(144) = 2.28, p < .05, SN, β = .22, t(144) = 2.75, p < .01, and PBB, β = .19, t(144) = 2.92, p < .01, predict burning

[2] When the relationship between each PN item and burning intention was analyzed separately, results were similar (all *ps* >.05).

intention. AC was not retained as a significant predictor of burning intention in the model, $\beta = -.01$, $t(144) = -.11$, $p = .91$.

We then ran a mediation analysis to determine which TPB variable(s) might have mediated the impact of AC on burning intention. We employed PROCESS model number 4, with 5000 bootstrap (see Preacher and Hayes 2008 for a review), to analyze the indirect effect of AC on burning intention via ATB, SN and PBC (controlling for age, PN, RD and PBB). There was a significant indirect effect of AC on burning intentions via ATB, boot indirect effect = -.22, SE = .07, 95% CI = -.3701, -.1018 and SN, boot indirect effect = -.07, SE = .03, 95% CI = -.1609, -.0213. However, there was no significant indirect effect of AC on burning intentions via PBC, boot indirect effect = -.03, SE = .03, 95% CI = -.1214, .0106 (see Figure 1).

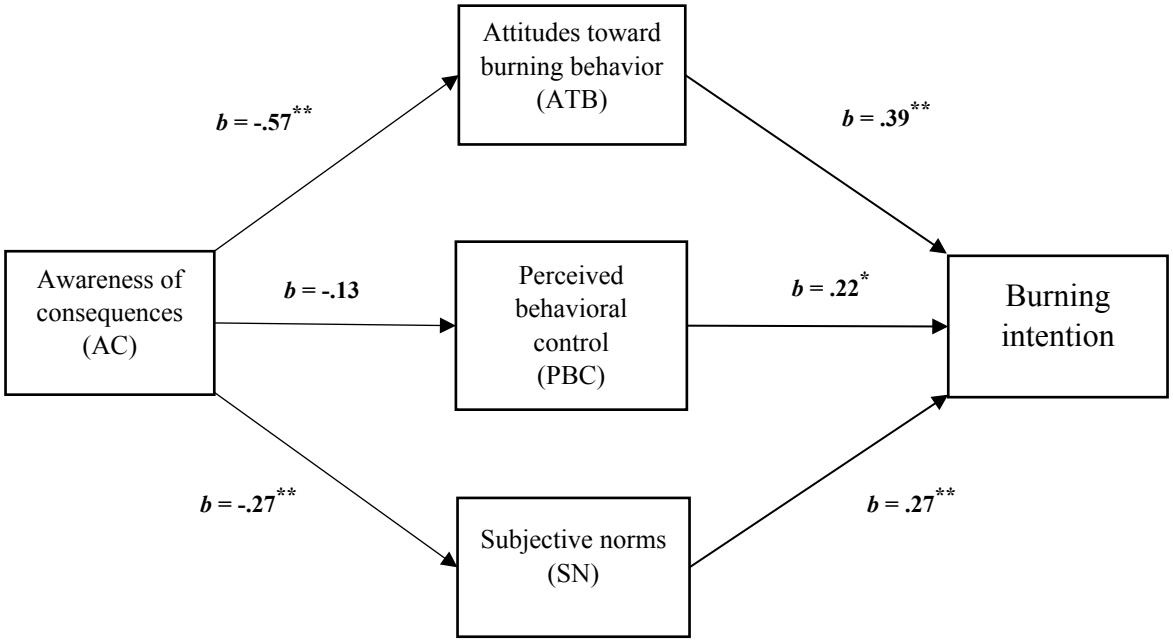

Figure 1. The relationship between AC and burning intention via ATB, PBC, and SN

4. Discussion

This study applies the TPB (Ajzen, 1991), incorporating a measure of past burning behavior, the NAM (Schwartz, 1977), and a hybridization of both theories, to investigate psychological factors underlying burning intention within a sample of small-scale farmers in Riau and Central Kalimantan provinces, Indonesia. Figure 2 depicts the optimal (hybrid) theoretical model of burning intention derived from the current study.

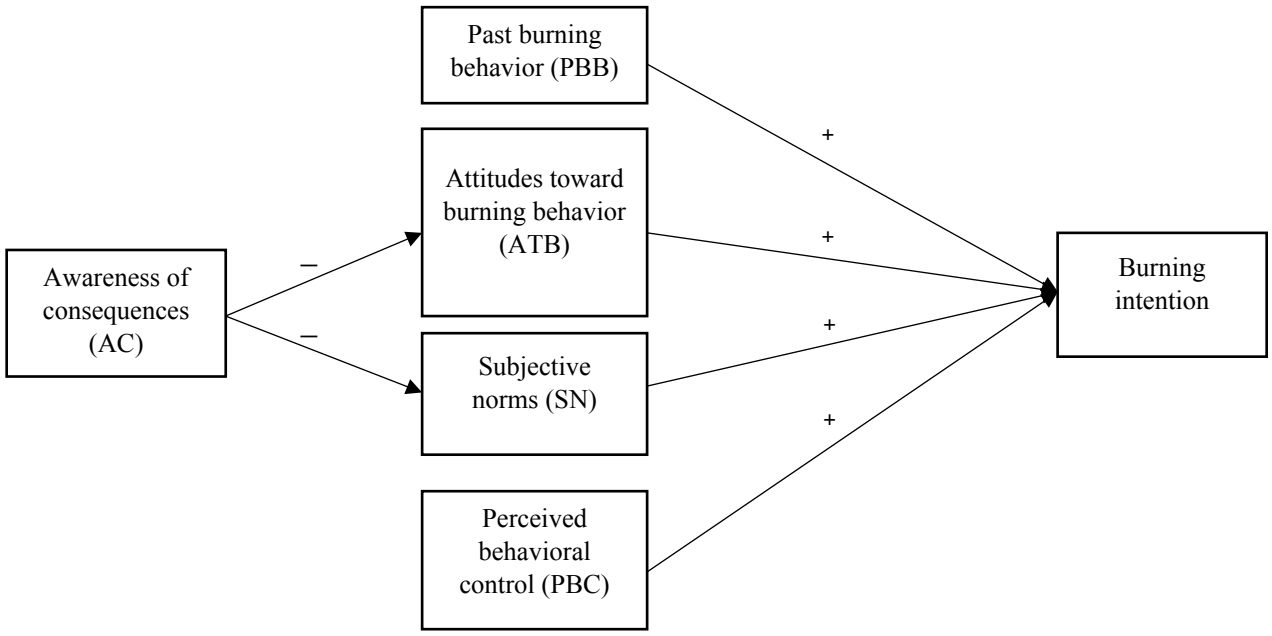

Figure 2. A hybrid theoretical model of burning intention among small-scale farmers in Indonesia.

Contrasting the strengths of TPB and NAM, our findings favor a hybridized model. This hybridized model combines the core components of the TPB, with past burning behavior (PBB) and awareness of consequences (AC) from the NAM. All of the key constructs of the TPB significantly predict burning intention, and thus this theory provides the basis for our hybridized model. The model explained (44%), which is broadly consistent

with findings of other studies using the TPB to understand environmentally significant behavior (see Staats, 2003). In contrast, we identify only partial support for the NAM. Although awareness of consequences and responsibility denial activate personal norms, the norms do not predict burning intention.

The superior explanatory power of the TPB constructs is, perhaps, to be expected due to the motivations behind burning behavior within our sample. Burning behavior can aid the success of subsistence agriculture (Conklin 1957; Dove 1983; Ellen 2012). Kleinman, Pimentel and Bryant (1995) suggest that burning can enhance soil fertility, while Henley (2011) emphasizes the importance of frequent and repeated burning of farmland to prevent the succession of destructive vegetation. Moreover, burning behavior has a long history within small-scale farming communities in Indonesia (Dove 1983; Padoch et al. 2007). Thus, burning behavior is commonly practiced among this population (Trihadmojo 2016), and is something that is under the control of famers and likely to yield personal benefits (e.g. increased crop yields). These are all factors that are congruent with rational choice models of behavior, like the TPB.

Our findings on the effect of attitudes toward burning behavior, perceived behavioral control, subjective norms on burning intention are corroborated by previous research that use TPB to understand farmer-nature relations. For example, Mastrangelo et al. (2014:107) demonstrate that the TPB have "the highest degree of fit and parsimony", which can explain farmers' intention to conserve remnants forest. Relatedly, Adnan, Nordin, and bin Abu Bakar (2017) show that the TPB explains a significant variance in paddy farmers' intention to engage with sustainable agricultural practices. In another example, Ward, Holmes, and Stringer (2018) suggest that the TPB can reveal factors underlying individuals' decision to participate in a forest conservation strategy.

Research also suggests that attitudes and intentions have a rather direct relationship. For example, Poppenborg and Koellner (2013:428) show that farmers' decision "to plant perennial crops are significantly influenced by high attitudes toward ecosystem services". Similarly, Deng et al. (2016) suggest that farmers' attitudes toward ecological conservation defines their intention to engage in a conservation intervention. In another example, Sood and Mitchell (2004) note that attitudes toward agroforestry as an important socio-psychological factor for farmers' decision to participate in agroforestry practices.

Taken together, we argue that farmers' immediate interests in securing their livelihoods and wellbeing take precedence over more diffuse—regional, national or global—considerations of environmental preservation. In essence, farmers' burning intention is largely self-interested, aligning it nicely with the core principles of the TPB. This is a good model of behavior in situations where people are seeking to maximize their personal utility (e.g., Abrahamse et al., 2009; Bamberg, Fujii, Friman, & Gärling, 2011). By contrast, the NAM—and related models like Value-Belief-Norm (e.g., Stern, Dietz, Abel, Guagnano, & Kalof, 1999)—are arguably superior in explaining behaviors where personal utility is as less prominent consideration (e.g., Steg & Vlek, 2009). That said, the optimal model of burning intention generated within our study (Figure 2), was firmly based on the incorporation of the awareness of consequences into the TPB.

The incorporation of awareness of consequences is consistent with previous research suggesting that a knowledge of the consequences of one's actions can influence attitudes toward environmentally significant behaviors (Flamm 2009; Kaiser, Wölfing, and Fuhrer 1999) and perceived social norms (Bamberg and Möser 2007). Importantly, the negative relationships between awareness of consequences and respondents' attitudes toward burning behavior and subjective norms identifies key routes through which pro-burning

attitudes, norms, and intentions can be modified. For example, this finding highlights the potential for informational interventions (e.g., educational campaigns) to raise people's awareness of the wider consequences of burning behavior as a means of addressing this problem behavior within our study context (Steg and Vlek 2009).

An equally important finding in this study is the positive relationship between past burning behavior and future burning intention. We argue that this can perhaps be partially explained by the *feedback effect* (Fishbein and Ajzen 1975); i.e. where previous experiences of engaging in a behavior shape a person's behavioral, normative, and control beliefs relating to that behavior. Perhaps farmers who have engaged in burning behavior may consider the behavior normal (Reid 2016). This is plausible as we measured reported burning behavior that has happened. The fact that burning behavior is rather common within our sample may also contribute to the feedback effect (Harland et al. 1999).

As Ajzen (1991) notes, subjective norm is the perceived social expectation or pressure to exhibit certain behavior. The norm reflects how individuals' belief on whether relevant others expect them to perform certain behavior in any given time. In this view, perceived normative pressure affect one's intention to perform a behavior. For example, Borges et al. (2014) note farmers' perceptions about social expectation to use improved natural grassland was correlated with their intention to use the grassland. Following this logic, it is possible that the positive impact of the subjective norm on burning behavior was caused by our respondents' perception that clearing land through burning during planting system is socially desirable.

The positive effect of perceived behavioral control on burning intention stems from famers' confidence to control the outcomes of clearing land through burning. In their study on the use of improved natural grassland, Borges et al. (2014:22) describe "sufficient

knowledge, sufficient skills, and availability of qualified technical assistance" as the drivers of perceived behavioral control, that have positive effect on farmers' intention to use the grassland. It, therefore, is reasonable to suggest that our respondents' knowledge and skills pertaining to their subsistence farming may explain the effect of perceived behavioral control on burning behavior. Also, our respondents live in close-knit community in the rural Indonesian forest. During planting season, land preparation and crop planting are carried out collectively (MacKinnon et al. 2013; Mertz et al. 2009). Every household shares the burden of clearing land and contributes to each other's planting.

While one must not assume that the presence and/or persistence of burning behavior stems solely from a position of ignorance about its wider consequences (e.g., Sturgis & Allum, 2004), concerted efforts to work with small-scale farmers and their families to raise their awareness of these consequences—and how to mitigate them—could offer a promising pathway toward more sustainable fire management. However, such efforts would need to be complemented by support systems to access alternative farming practices or means of production and livelihood (Watts et al. 2019). We argue that a useful next step in this research would be to conduct a more detailed appraisal of farmers' attitudes and norms in order to investigate: (a) the extent to which farmers are aware of the diverse negative consequences of burning behavior; and (b) how such awareness might be augmented (e.g., through education programs) to change attitudes, norms and intentions.

5. Limitations and Directions for Future Research

While this study offers fresh insight into the psychological factors behind burning intention in Indonesia, there are several limitations to the study design. These limitations present avenues for future research. This research was restricted in scope due to the available time and resource, which limits us to a one-off, cross-sectional survey design.

A cross-sectional design provides only a snapshot of burning intention at one time-point, whereas a longitudinal design could identify the dynamics associated with a given phenomenon over time (see Levin, 2006). Future research could usefully employ a longitudinal design to investigate the relative (in-)stability of perceptions of burning behavior within a farming community across a given farming season(s). In doing so, one would have the opportunity to investigate how external influences (e.g., seasonal forest and land fires, implementation of legislation, etc.) affect the internal character of farmers (e.g., their beliefs, attitudes, norms and intentions) as well as to observe actual behaviors within the population over time.

A second limitation is that we assessed behavioral intention as opposed to an actual behavior. Although the TPB and the hybrid model may indicate correlation between burning intention and the actual burning behavior, the intention-behavior gap remain an commonly reported phenomenon in psychological research (see Sheeran, 2002). This phenomenon points to inconsistencies in people's stated intentions and their actual behaviors (see Kollmuss & Agyeman, 2002).

Another limitation in this study is that we did not fully conform to the Target, Action, Context, and Time (TACT) criteria when operationalizing the items relating to the TPB constructs (Ajzen 2002). In particular, our items were not timebound. For example, we did not specify a timescale for future burning intention (e.g. burning intention in the next year, or five years, or ten years, etc.). Thus, future research needs to be mindful of Ajzen's (2002) TACT criteria when creating TPB-based surveys to assess burning behavior, including being specific about the timescales over which the behavior is to be considered.

A final limitation of this study concerns on the use of self-report methodology. While questionnaire-based surveys are commonplace, this method is particularly problematic in

relation to controversial topics, such as burning behavior. Social desirability bias might possibly influenced participants' responses (Crowne and Marlowe 1964), especially where the survey is distributed and collected in person (e.g., Robson & Kieran, 2016)— affecting survey scores (Huang, Liao, and Chang 1998). Therefore, we suggest that future research assess the extent to which people wish to present themselves in socially desirable manner (e.g., Ray, 1984), so this bias can be controlled for in the analysis and higher rate of reliability and validity can be established.

6. Conclusion

This study explains psychological factors behind intention to engage in burning behavior within small-scale farmers in Indonesia. The findings identify that an augmented version of the TPB, as opposed to the NAM, was a good model to explain burning intention. These findings reflect the primacy of self-interested motivations (e.g., food provision) over wider pro-environmental concern in driving this behavior. That said, the retention of awareness of consequences in our model (as an indirect antecedent of behavioral intention) hints that efforts to increase farmers' awareness of the negative consequences of burning behavior could be a means of intervening on this problem behavior. On this basis, we argue that targeted education alongside structural strategies for changing behavior (e.g., the provision of finance and/or alternative means of land clearing) could present an effective means of modifying burning behavior and reducing the risk of forest and peat fires.

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9. Conflict of Interest

The authors declare that they have no conflict of interest.

10. Reference

Abrahamse, Wokje and Linda Steg. 2009. "How Do Socio-Demographic and Psychological Factors Relate to Households' Direct and Indirect Energy Use and Savings?" *Journal of Economic Psychology* 30(5):711–20.

Abrahamse, Wokje, Linda Steg, Robert Gifford, and Charles Vlek. 2009. "Factors Influencing Car Use for Commuting and the Intention to Reduce It: A Question of Self-Interest or Morality?" *Transportation Research Part F: Traffic Psychology and Behaviour* 12(4):317–24.

Adnan, Nadia, Shahrina Md Nordin, and Zulqarnain bin Abu Bakar. 2017. "Understanding and Facilitating Sustainable Agricultural Practice: A Comprehensive Analysis of Adoption Behaviour among Malaysian Paddy Farmers." *Land Use Policy* 68:372–82.

Ajzen, I. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision*

Processes 50:179–211.

Ajzen, Icek. 2002. "Constructing a TPB Questionnaire: Conceptual and Methodological Considerations."

Ayob, Siti Fadzilah, Sheau-Ting Low, and Rohaya Abdul Jalil. 2017. "Key Determinants of Waste Separation Intention : Empirical Application of TPB." *Facilities*.

Bamberg, Sebastian, Satoshi Fujii, Margareta Friman, and Tommy Gärling. 2011. "Behaviour Theory and Soft Transport Policy Measures." *Transport Policy* 18(1):228–35.

Bamberg, Sebastian and Guido Möser. 2007. "Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour." *Journal of Environmental Psychology* 27(1):14–25.

Bates, Benjamin R., Brian L. Quick, and Aaron A. Kloss. 2009. "Antecedents of Intention to Help Mitigate Wildfire: Implications for Campaigns Promoting Wildfire Mitigation to the General Public in the Wildland-Urban Interface." *Safety Science* 47(3):374–81.

BBC News. 2019. "Indonesia Haze: Why Do Forests Keep Burning?" September 16.

Borges, João Augusto Rossi, Alfons G. J. M. Oude Lansink, Claudio Marques Ribeiro, and Vanessa Lutke. 2014. "Understanding Farmers' Intention to Adopt Improved Natural Grassland Using the Theory of Planned Behavior." *Livestock Science* 169:163–74.

Bright, A. D. and R. T. Burtz. 2006. "Firewise Activities of Full-Time versus Seasonal Residents in the Wildland-Urban Interface." *Journal of Forestry* 104(6):307–15.

Carmenta, Rachel, Emilie Coudel, and Angela M. Steward. 2018. "Forbidden Fire: Does Criminalising Fire Hinder Conservation Efforts in Swidden Landscapes of the Brazilian Amazon?" *Geographical Journal* (February):1–15.

Cattau, Megan E., Mark E. Harrison, Iwan Shinyo, Sady Tungau, María Uriarte, and Ruth DeFries. 2016. "Sources of Anthropogenic Fire Ignitions on the Peat-Swamp Landscape in Kalimantan, Indonesia." *Global Environmental Change* 39:205–19.

Chang, Hyo Jung and Kittichai (Tu) Watchravesringkan. 2018. "Who Are Sustainably Minded Apparel Shoppers? An Investigation to the Influencing Factors of Sustainable Apparel Consumption." *International Journal of Retail & Distribution Management* 46(2):148–62.

Chin, Yongchang. 2019. "Southeast Asia Braces for Haze as Forest Fires Keep Burning." September 13.

Conklin, H. C. 1957. *Hanunoo Agriculture. A Report on an Integral System of Shifting Cultivation in the Philippines*.

Cordano, Mark, Stephanie Welcomer, Robert F. Scherer, Lorena Pradenas, and Víctor Parada. 2011. "A Cross-Cultural Assessment of Three Theories of pro-Environmental Behavior: A Comparison between Business Students of Chile and the United States." *Environment and Behavior* 43(5):634–57.

Cramb, R. A., Carol J. Pierce Colfer, Wolfram Dressler, Pinkaew Laungaramsri, Quang Trang Le, Elok Mulyoutami, Nancy L. Peluso, and Reed L. Wadley. 2009. "Swidden Transformations and Rural Livelihoods in Southeast Asia." *Human Ecology* 37(3):323–46.

Crowne, D. P. and D. Marlowe. 1964. *The Approval Motive: Studies in Evaluative Dependence*.

New York: Wiley.

Deng, Jian, Pingsheng Sun, Fazhu Zhao, Xinhui Han, Gaihe Yang, and Yongzhong Feng. 2016. "Analysis of the Ecological Conservation Behavior of Farmers in Payment for Ecosystem Service Programs in Eco-Environmentally Fragile Areas Using Social Psychology Models." *Science of The Total Environment* 550:382–90.

Dennis, R. 1999. *A Review of Fire Projects in Indonesia (1982-1998)*. Jakarta, Indonesia: Center for International Forestry Research (CIFOR).

Diamantopoulos, Adamantios, Marko Sarstedt, Christoph Fuchs, Petra Wilczynski, and Sebastian Kaiser. 2012. "Guidelines for Choosing between Multi-Item and Single-Item Scales for Construct Measurement: A Predictive Validity Perspective." *Journal of the Academy of Marketing Science* 40(3):434–49.

Dove, Michael R. 1983. "Theories of Swidden Agriculture, and the Political Economy of Ignorance." *Agroforestry Systems* 1(2):85–99.

Ellen, Roy F. 2012. "Studies of Swidden Agriculture in Southeast Asia since 1960: An Overview and Commentary on Recent Research and Syntheses." *Asia Pacific World* 3(1):18–38.

Fishbein, M. and Icek Ajzen. 1975. *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Vol. 27.

Flamm, Bradley. 2009. "The Impacts of Environmental Knowledge and Attitudes on Vehicle Ownership and Use." *Transportation Research Part D: Transport and Environment* 14(4):272–79.

Fox, J. M. 2000. "How Blaming 'slash and Burn' Farmers Is Deforesting Mainland Southeast Asia." *Asia Pacific Issues* (47):3–8.

Gaveau, David L. A., Romain Pirard, Mohammad A. Salim, Prayoto Tonoto, Husna Yaen, Sean A. Parks, and Rachel Carmenta. 2017. "Overlapping Land Claims Limit the Use of Satellites to Monitor No-Deforestation Commitments and No-Burning Compliance." *Conservation Letters* 10(2):257–64.

Gifford, Robert and Andreas Nilsson. 2014. "Personal and Social Factors That Influence Pro-Environmental Concern and Behaviour : A Review." *International Journal of Psychology* 49(3):141–57.

Greenpeace Southeast Asia. 2019. "ASEAN Haze 2019: The Battle of Liability." Retrieved (https://www.greenpeace.org/southeastasia/press/3221/asean-haze-2019-the-battle-of-liability/#_ftn18).

De Groot, Judith and Linda Steg. 2009. "Morality and Prosocial Behavior: The Role of Awareness, Responsibility, and Norms in the Norm Activation Model." *Journal of Social Psychology* 149(4):425–49.

Harland, Paul, Henk Staats, and Henk A. M. Wilke. 1999. "Explaining Proenvironmental Intention and Behavior by Personal Norms and the Theory of Planned Behavior." *Journal of Applied Social Psychology* 29(12):2505–28.

Harris, Nancy, Susan Minnemeyer, Fred Stolle, and Octavia Aris Payne. 2015. "Indonesia's Fire Outbreaks Producing More Daily Emissions than Entire US Economy." *World Resource Institute's Blog* 1–8.

Henley, David. 2011. “Swidden Farming as an Agent of Environmental Change: Ecological Myth and Historical Reality in Indonesia.” *Environment and History* 17(4):525–54.

Hine, Donald W., Anthony D. G. Marks, Malte Nachreiner, Robert Gifford, and Yuko Heath. 2007. “Keeping the Home Fires Burning: The Affect Heuristic and Wood Smoke Pollution.” *Journal of Environmental Psychology* 27(1):26–32.

Huang, Chiou-yan, Hsin-ya Liao, and Sue-hwang Chang. 1998. “Social Desirability and the Clinical Self-Report Inventory : Methodological Reconsideration.” *Journal of Clinical Psychology* 54(4):517–28.

Jefferson, Una, Rachel Carmenta, Willy Daeli, and Jacob Phelps. 2020. “Characterising Policy Responses to Complex Socio-Ecological Problems: 60 Fire Management Interventions in Indonesian Peatlands.” *Global Environmental Change* 60:102027.

Jong, Hans Nicholas. 2019a. “Area the Size of Puerto Rico Burned in Indonesia’s Fire Crisis.” Retrieved (https://news.mongabay.com/2019/10/indonesia-fire-burning-forest-haze-hotspots-peatland-deforestation/).

Jong, Hans Nicholas. 2019b. “Indonesia Fires Emitted Double the Carbon of Amazon Fires, Research Shows.” Retrieved (https://news.mongabay.com/2019/11/indonesia-fires-amazon-carbon-emissions-peatland/).

Kaiser, Florian G., Sybille Wölfing, and Urs Fuhrer. 1999. “Environmental Attitude and Ecological Behaviour.” *Journal of Environmental Psychology* 19(1):1–19.

Kleinman, P. J. A., D. Pimentel, and R. B. Bryant. 1995. “The Ecological Sustainability of Slash-and-Burn Agriculture.Pdf.” *Agriculture, Ecosystems & Environment* 52(2–3):235–249.

Kollmuss, Anja and Julian Agyeman. 2002. “Mind the Gap: Why Do People Behave Environmentally and What Are the Barriers to Pro-Environmental Behaviour.” *Environmental Education Research* 8(3):239–60.

Levin, Kate Ann. 2006. “Study Design III: Cross-Sectional Studies.” *Evidence-Based Dentistry* 7(1):24–25.

Van Liere, Kent D. and Riley E. Dunlap. 1978. “Moral Norms and Environmental Behavior: An Application of Schwartz’s Norm-Activation Model to Yard Burning.” *Journal of Applied Social Psychology* 8(2):174–88.

MacKinnon, Kathy, Gusti Hatta, Hakimah Halim, and Arthur Mangalik. 2013. *The Ecology of Kalimantan: Indonesian Borneo*. Vol. 3. Tuttle Publishing.

Mahmud, Siti Nur Diyana and Kamisah Osman. 2010. “The Determinants of Recycling Intention Behavior among the Malaysian School Students: An Application of Theory of Planned Behaviour.” *Procedia - Social and Behavioral Sciences* 9:119–24.

Mastrangelo, Matías E., Michael C. Gavin, Pedro Laterra, Wayne L. Linklater, and Taciano L. Milfont. 2014. “Psycho-Social Factors Influencing Forest Conservation Intentions on the Agricultural Frontier.” *Conservation Letters* 7(2):103–10.

Meehan, Fiona, Luca Tacconi, and Kushartati Budiningsih. 2019. “Are National Commitments to Reducing Emissions from Forests Effective? Lessons from Indonesia.” *Forest Policy and Economics* 108:101968.

Mertz, Ole, Christine Padoch, Jefferson Fox, R. A. Cramb, Stephen J. Leisz, Nguyen Thanh Lam, and Tran Duc Vien. 2009. "Swidden Change in Southeast Asia: Understanding Causes and Consequences." *Human Ecology* 37(3):259–64.

Onwezen, Marleen C., Gerrit Antonides, and Jos Bartels. 2013. "The Norm Activation Model: An Exploration of the Functions of Anticipated Pride and Guilt in pro-Environmental Behaviour." *Journal of Economic Psychology* 39:141–53.

Padoch, Christine, Kevin Coffey, Ole Mertz, Stephen J. Leisz, Jefferson Fox, and Reed L. Wadley. 2007. "The Demise of Swidden in Southeast Asia? Local Realities and Regional Ambiguities." *Geografisk Tidsskrift-Danish Journal of Geography* 107(1):29–41.

Poppenborg, Patrick and Thomas Koellner. 2013. "Do Attitudes toward Ecosystem Services Determine Agricultural Land Use Practices? An Analysis of Farmers' Decision-Making in a South Korean Watershed." *Land Use Policy* 31:422–29.

Preacher, Kristopher J. and Andrew F. Hayes. 2008. "Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models." *Behavior Research Methods* 40(3):879–91.

Ray, John J. 1984. "The Reliability of Short Social Desirability Scales." *The Journal of Social Psychology.* 123(1):133–34.

Reid, J. Leighton. 2016. "Knowledge and Experience Predict Indiscriminate Bat-Killing Intentions among Costa Rican Men." *Biotropica* 48(3):394–404.

Reuters. 2019. "Area Burned in 2019 Forest Fires in Indonesia Exceeds 2018 - Official." October 21.

Robson, Colin and McCartan Kieran. 2016. *Real World Research*. John Wiley & Sons.

Rusmana, Yoga. 2019. "Forest Fire Emissions From Indonesia Worse Than Amazon, EU Says." November 26.

Schwartz, S. H. 1977. "Normative Influences on Altruism." Pp. 221–279 in *Advances in Experimental Social Psychology*, edited by L. Berkowitz. San Diego: Academic Press.

Schwartz, S. H. and J. A. Howard. 1981. "A Normative Decision-Making Model of Altruism." Pp. 189–211 in *, Altruism and helping behaviour: Social, personality and developmental perspectives*. Hillsdale, NJ: Erlbaum.

Sheeran, Paschal. 2002. "Intention-Behavior Relations: A Conceptual and Empirical Review." *European Review of Social Psychology* 12(1):1–36.

Sloan, Sean, Bruno Locatelli, Martin J. Wooster, and David L. A. Gaveau. 2017. "Fire Activity in Borneo Driven by Industrial Land Conversion and Drought during El Niño Periods, 1982–2010." *Global Environmental Change* 47:95–109.

Sood, Kamal Kishor and C. Paul Mitchell. 2004. "Do Socio-Psychological Factors Matter in Agroforestry Planning? Lessons from Smallholder Traditional Agroforestry Systems." *Small-Scale Forest Economics, Management and Policy* 3(2):239–55.

Staats, Henk. 2003. "Understanding Proenvironmental Attitudes and Behavior: An Analysis and Review of Research Based on the Theory of Planned Behavior." Pp. 171–201 in *Psychological Theories for Environmental Issues*. Aldershot: Ashgate.

Steg, Linda and Judith de Groot. 2010. “Explaining Prosocial Intentions: Testing Causal Relationships in the Norm Activation Model.” *British Journal of Social Psychology* 49(4):725–43.

Steg, Linda and Charles Vlek. 2009. “Encouraging Pro-Environmental Behaviour: An Integrative Review and Research Agenda.” *Journal of Environmental Psychology* 29(3):309–17.

Stern, P. C., T. Dietz, T. Abel, G. A. Guagnano, and L. Kalof. 1999. “A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism.” *Human Ecology Review* 6(2):81–97.

Sturgis, Patrick and Nick Allum. 2004. “Science in Society: Re-Evaluating the Deficit Model of Public Attitudes.” *Public Understanding of Science* 13(1):55–74.

Tacconi, Luca. 2016. “Preventing Fires and Haze in Southeast Asia.” *Nature Climate Change* 6(7):640–43.

The Straits Times. 2019. “Respiratory Illness Spikes, Travel Affected as Haze Hits South-East Asia.” September 17.

Thung, Paul Hasan. 2018. “A Case Study on the Persistence of Swidden Agriculture in the Context of Post-2015 Anti-Haze Regulation in West-Kalimantan.” *Human Ecology* 46(2):197–205.

Trihadmojo, Bambang. 2016. “Identifying Etic and Emic Factors Underlying Burning Behaviour in Indonesia: Quantitative and Qualitative Evidence (Unpublished Masters Dissertation).” University of Lancaster, UK.

Ward, Caroline, George Holmes, and Lindsay Stringer. 2018. “Perceived Barriers to and Drivers of Community Participation in Protected-Area Governance.” *Conservation Biology* 32(2):437–46.

Watts, John D., Luca Tacconi, Nindita Hapsari, Silvia Irawan, Sean Sloan, and Triyoga Widiastomo. 2019. “Incentivizing Compliance: Evaluating the Effectiveness of Targeted Village Incentives for Reducing Burning in Indonesia.” *Forest Policy and Economics* 108:101956.

Wijedasa, Lahiru S., Jyrki Jauhiainen, Mari Könönen, Maija Lampela, Harri Vasander, Marie Claire Leblanc, Stephanie Evers, Thomas E. L. Smith, Catherine M. Yule, Helena Varkkey, Massimo Lupascu, Faizal Parish, Ian Singleton, Gopalasamy R. Clements, Sheema Abdul Aziz, Mark E. Harrison, Susan Cheyne, Gusti Z. Anshari, Erik Meijaard, Jenny E. Goldstein, Susan Waldron, Kristell Hergoualc’h, Rene Dommain, Steve Frolking, Christopher D. Evans, Mary Rose C. Posa, Paul H. Glaser, Nyoman Suryadiputra, Reza Lubis, Truly Santika, Rory Padfield, Sofyan Kurnianto, Panut Hadisiswoyo, Teck Wyn Lim, Susan E. Page, Vincent Gauci, Peter J. Van Der Meer, Helen Buckland, Fabien Garnier, Marshall K. Samuel, Liza Nuriati Lim Kim Choo, Patrick O’Reilly, Matthew Warren, Surin Suksuwan, Elham Sumarga, Anuj Jain, William F. Laurance, John Couwenberg, Hans Joosten, Ronald Vernimmen, Aljosja Hooijer, Chris Malins, Mark A. Cochrane, Balu Perumal, Florian Siegert, Kelvin S. H. Peh, Louis Pierre Comeau, Louis Verchot, Charles F. Harvey, Alex Cobb, Zeehan Jaafar, Henk Wösten, Solichin Manuri, Moritz Müller, Wim Giesen, Jacob Phelps, Ding Li Yong, Marcel Silvius, Béatrice M. M.

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Zhang, Xiaojie, Jiao Liu, and Ke Zhao. 2018. "Resources , Conservation & Recycling Antecedents of Citizens ' Environmental Complaint Intention in China : An Empirical Study Based on Norm Activation Model." *Resources, Conservation & Recycling* 134(December 2017):121–28.

Declaration of interests

 The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Bambang Trihadmojo: Conceptualization, Methodology, Data collection, Preparing original draft. **Christopher Jones:** Writing, Reviewing, and Editing. **Bramesada Prasastyoga:** Data analyses and Editing. **Chris Walton:** Supervision. **Ahmad Sulaiman:** Reviewing and Editing.