



Public opinion on protecting iconic species depends on individual wellbeing: Perceptions about orangutan conservation in Indonesia and Malaysia

Emily J. Massingham^{a,b,*}, Kerrie A. Wilson^{c,2}, Erik Meijaard^{b,d,3}, Marc Ancrenaz^{d,e,4}, Truly Santika^{f,5}, Rachel Friedman^{g,6}, Hugh P. Possingham^{a,b,7}, Angela J. Dean^{b,c,h,8}

^a School of the Environment, The University of Queensland, Brisbane, QLD 4072, Australia

^b Centre for Biodiversity and Conservation Science, The University of Queensland, QLD 4072, Australia

^c Queensland University of Technology, Brisbane, QLD 4072, Australia

^d Borneo Futures, 8th Floor, PGGMB Building, Jalan Kianggeh, Bandar Seri Begawan BS8111, Brunei Darussalam

^e HUTAN, Kinabatangan Orangutan Conservation Programme, P.O. Box 17793, Kota Kinabalu, Sabah 88874, Malaysia

^f Natural Resources Institute (NRI), University of Greenwich, Chatham Maritime, Kent, UK

^g The Australian National University, Canberra, ACT 2600, Australia

^h School of Agriculture and Food Sustainability, The University of Queensland, St Lucia 4072, Australia

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ABSTRACT

Public opinion has the potential to shape conservation policy-making and implementation. At a local scale, it is argued that human wellbeing is important for conservation success. However, little research has explored how social factors like wellbeing shape public opinion at cross-national scales. Here, we focus on orangutan conservation, where an iconic species near extinction exists amidst complex social issues. We surveyed 2073 Indonesian and Malaysian residents and assessed three indicators of conservation support: policy support, willingness to act for the environment, and willingness to act for orangutans. We then examined how diverse indicators of wellbeing shaped support for orangutan conservation. Our results show that diverse indicators of wellbeing are related to public opinions supportive of conservation in Indonesian and Malaysian citizens. Consistent with our hypotheses, both physical (having basic needs met) and psychological (being free from worry, feeling safe, a sense of agency) wellbeing were positively associated with all three indicators of conservation support. Contrary to common assumptions, not all wellbeing indicators were related to conservation support; we found no evidence that subjective health was positively associated with conservation support. Overall, these findings indicate that social factors such as wellbeing might have an important influence on public opinion about conservation issues, and subsequently, environmental policy-making. Our findings highlight the complexity of the relationship between wellbeing and public opinion, alongside the need to consider multi-dimensional aspects of wellbeing across diverse social and geographic settings.

* Corresponding author at: School of the Environment, The University of Queensland, Brisbane, QLD 4072, Australia.

E-mail address: e.massingham@uqconnect.edu.au (E.J. Massingham).

¹ 0000-0002-9498-2994

² 0000-0002-0092-935X

³ 0000-0001-8685-3685

⁴ 0000-0003-2325-2879

⁵ 0000-0002-3125-9467

⁶ 0000-0002-9437-9239

⁷ 0000-0001-7755-996X

⁸ 0000-0003-4017-4809

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1. Introduction

1.1. The importance of public opinion for shaping policy

Tackling environmental challenges requires multifaceted approaches, spanning both government and society. Public opinion has the potential to wield an important influence on environmental policies. For example, regarding climate change, research demonstrates that public opinion can support shifts in government policy and action towards reducing emissions (Anderson et al., 2017; Bakaki et al., 2020). The potential relationship between public opinion and policy action is complex, and may involve government responsiveness to public sentiment, direct public advocacy, or indirect public support for advocacy organisations (Popović, 2020). Importantly, public opinion is only one of many factors that influence policy-making, which is also affected by political processes (Kuhl, 2021; Rasmussen et al., 2021). It has been argued that one important element facilitating the link between public opinion and policy action is ‘issue salience’ (Bromley-Trujillo and Poe, 2020; Burstein, 2003). Specifically, Bromley-Trujillo and Poe (2020) argue that for public opinion to influence policy, not only do people need to acknowledge there is a problem, but they need to be willing to find out more about the issue and actions to support it. This means that a crucial question is: what factors influence public opinion about conservation issues and an individual’s willingness to take action on these issues?

Within the context of biodiversity conservation, the Convention on Biological Diversity lists “mainstreaming biodiversity across government and society” as a strategic goal (CBD, 2011). This highlights the importance of understanding public opinion about conservation issues, what shapes public support for conservation policies, and an individual’s willingness to take action on these issues. Much existing research into public support for diverse environmental policies indicates that public opinion may be shaped by a range of psychological factors such as values, worldviews and social connectedness, and procedural beliefs about fairness and transparency (Dean et al., 2016; Guo et al., 2021; Hao et al., 2020; Huber et al., 2020; Kolcava and Bernauer, 2021; MacDonald et al., 2020). However, there are few studies that examine what shapes public opinion about key issues related to biodiversity conservation practice, such as perceptions of strategies to protect threatened species. When considering on-ground conservation programs—such as village-level initiatives to reduce poaching of a threatened species—it is commonly argued that the wellbeing of community members is necessary to secure their support for conservation initiatives (Brichieri-Colombi et al., 2018; Burgess et al., 2009; Game et al., 2014; Gurney et al., 2014; Milner-Gulland et al., 2014). However, there is limited robust empirical evidence to support this common narrative, at a village level or national level. This study will address this gap in the literature at a national level, by exploring the relationship between indicators of wellbeing and perceptions of orangutan conservation initiatives in Indonesian and Malaysian residents. We begin by defining wellbeing, followed by an exploration of theoretical and empirical evidence suggesting a relationship between wellbeing and conservation support.

1.2. Conceptualising wellbeing

Wellbeing is a multidimensional construct, spanning biological, social and psychological domains. Based on research spanning 23 countries, Narayan et al. (2000) found five dimensions of human needs: bodily needs, security needs, material needs, social and psychological wellbeing, and freedom of action (Alkire, 2002). Milner-Gulland et al. (2014) developed a framework for understanding wellbeing in a conservation context. The framework posits three conditions that must be met to experience wellbeing: having needs met, ability to pursue goals, and satisfactory quality of life. It has been argued that not all needs are equal but may instead operate in a hierarchy. Maslow (1943) suggests

that basic physical needs—such as food, water and shelter—are typically prioritised until they are met, at which point the person can focus on meeting higher-order psychological needs such as pursuing self-development goals (Deci and Ryan, 2000; Gorman, 2010). For most individuals, protecting biodiversity would fall in the highest order of needs (Cinner and Pollnac, 2004). Research shows that not having needs met can undermine an individual’s capacity to consider issues beyond their immediate needs (Shafir, 2014; Spears, 2011). As such, having basic needs met or experiencing a certain level of wellbeing might be an important precursor to supporting conservation initiatives.

1.3. Relationship between wellbeing and conservation support

Most of the research and commentary about wellbeing and conservation support focuses on initiatives that operate at localised scales such as villages or regions. For example, community-based conservation initiatives aim to address the needs and aspirations of local people alongside on-ground protection of threatened species and habitats (Brichieri-Colombi et al., 2018). While trade-offs between social and environmental benefits of conservation may exist (Persha et al., 2011), research suggests that addressing human needs in conservation not only delivers social benefits, but may also enhance conservation outcomes (Bennett et al., 2017; Coulthard et al., 2011; Woodhouse et al., 2017). One rationale for this is that when conservation programs invest in providing for the needs of individuals within relevant communities, these programs engender greater support from those communities (Bennett and Dearden, 2014; Holmes, 2013; Kideghesho et al., 2007; Singleton et al., 2019; Waylen et al., 2010).

While conservation programs may consider human wellbeing in the design and evaluation of conservation interventions (McKinnon et al., 2016; Milner-Gulland et al., 2014), wellbeing is rarely assessed in a comprehensive manner (Burivalova et al., 2017; McKinnon et al., 2016; Santika et al., 2017b). Two exceptions to this are studies examining the effect of community-managed forests on wellbeing, which assessed diverse dimensions of wellbeing, from bodily needs and basic living conditions, through to social equity and freedom of action (Loveridge et al., 2021; Santika et al., 2019). Typically, research focuses on wellbeing constructs that are easily measured, such as income-based indicators of poverty, meaning that more complex components of wellbeing—such as perceived safety, social connections, goal pursuit, or happiness—are not often captured (Hicks et al., 2016; Woodhouse et al., 2015). Moreover, most conservation studies that assess wellbeing examine how conservation programs influence wellbeing (Lange et al., 2016), rather than examining how community wellbeing can enable the success of conservation programs. While it has become popular to assert that meeting basic human needs is universally important, even essential, to achieve conservation outcomes (Berkes, 2012; Roe and Elliott, 2006), there is limited empirical data to support this theory. As such, deficiencies remain in our understanding of how wellbeing—and its diverse components—influence potential for conservation success (Hajjar and Molnar, 2015; Hajjar and Oldekop, 2018; Yin et al., 2016).

It is argued that improved conservation practice requires a better understanding of the relationship between wellbeing and conservation interventions across diverse spatial scales (Milner-Gulland et al., 2014). Effective conservation requires both local programs that work closely with project-affected communities and effective national policies. The latter relies upon widespread social support to enable the successful implementation and enforcement of such policies. Coulthard et al. (2011) suggest that human wellbeing is important for policy success because policies seek to change human behaviour and the pursuit of wellbeing is a key driver of decisions and behaviours (Deci and Ryan, 2000; Kahneman et al., 1999). However, the influence of social factors such as wellbeing on support for effective conservation policies at these larger scales remain understudied (McKinnon et al., 2016). Our study tackles these gaps in the literature by examining public opinion about great ape conservation and how this is shaped by human wellbeing at a

multi-country scale. Identifying factors that enable public support for conservation policies can identify opportunities to work more effectively with diverse communities to strengthen conservation support at scale.

1.4. The current study

Protecting species is complicated; successful conservation requires both localised action *and* effective policy-making and investment at a national level. Here we examine how various wellbeing indicators influence public opinion about orangutan conservation policies and public willingness to be actively involved in these issues. We draw on population surveys conducted across Indonesia and Malaysia. We use the term ‘conservation support’ to describe support for conservation policies and willingness to act to support conservation. Most orangutan conservation efforts have concentrated on locally-focused species and forest protection, without approaching the more complex socio-political context in which orangutan conservation exists (Chua et al., 2020; Harrison et al., 2020; Meijaard, 2017). This study provides an important opportunity to assess public opinion about orangutan conservation and to examine the relationship between such public opinion and diverse indicators of wellbeing (Chua et al., 2020). We examine whether those with greater wellbeing—as measured by having basic needs met, a sense of safety, subjective health, absence of worries, social participation, a sense of agency, and happiness—are more likely to support, and more willing to participate in, orangutan conservation initiatives in Malaysia and Indonesia.

2. Methods

2.1. Study area and context

Our study was conducted in Indonesia and Malaysia (Fig. 1). This region of tropical Asia has some of the highest levels of biodiversity and endemism worldwide (Koh and Sodhi, 2010; Myers et al., 2000). Orangutans occur on the island of Borneo (covering the region of Kalimantan in Indonesia and Sarawak and Sabah in Malaysia) and the Indonesian island of Sumatra (Fig. 1). Orangutans are fully protected by law in both countries (Abram et al., 2015; Meijaard et al., 2011; Wich et al., 2012). However, despite national protection plans, orangutan numbers are declining in both countries (Santika et al., 2017a) and all three orangutan species are classified as critically endangered (Ancrenaz et al., 2016; Nowak et al., 2016; Singleton et al., 2017). Both Indonesia and Malaysia have national environmental policies designed to target biodiversity protection at local, national and international scales. The two primary causes of orangutan population decline are anthropogenic: habitat loss and direct killing of orangutans (Ancrenaz et al., 2016; Austin et al., 2019; Meijaard et al., 2012; Nowak et al., 2016; Singleton et al., 2017). The nature of habitat loss differs between Sumatra, Kalimantan and Malaysia. In Indonesia, and particularly in Kalimantan, forest loss was rapid until ca. 2012, when losses declined (Austin et al., 2019; Gaveau et al., 2021), whereas most forest loss in Malaysia occurred before 2000 (Wicke et al., 2011). This means that minimal deforestation occurs in Malaysia and most orangutan populations already reside inside protected areas or wildlife reserves. As such, ongoing forest loss, and associated exacerbation of hunting, are the primary threats in Indonesia, and habitat fragmentation is the main



Fig. 1. Study countries Indonesia and Malaysia (in grey) and distribution of all three orangutan species (Sumatran Orangutan, Bornean Orangutan and Tapanuli Orangutan) (in green) (Ancrenaz et al., 2016; Nowak et al., 2016; Singleton et al., 2017).

threat in Malaysia (Santika et al., 2017a). Malaysia and Indonesia are experiencing rapid population growth (Jones, 2013; United Nations, 2019) and increasing agricultural development (Bissonnette and De Koninck, 2017). Forest loss in both countries has stemmed from diverse pressures, including fires and expansion of cash crop monocultures such as oil palm and rubber trees (Austin et al., 2019; Gaveau et al., 2019; Santika et al., 2019; Wooster et al., 2012). Palm oil provides important revenue in Indonesia and Malaysia, both for foreign exchange and in-country employment (Koh and Wilcove, 2008; Meijaard et al., 2018). Meanwhile, many rural communities still depend on forests for livelihoods and basic needs (Bureau of Statistics Indonesia, 2017; Santika et al., 2021). In addition to village-level conservation programs that seek to reduce hunting or habitat loss, protecting orangutans requires the development of effective policies at the national level, improved collaboration across levels of government, and commitment to investing in policy implementation and enforcement (Abram et al., 2015; Natusch and Lyons, 2012; Santika et al., 2017b).

2.2. Participants and procedure

Data for this study were obtained from a national survey that examined dimensions of human wellbeing alongside support for conservation in Indonesia and Malaysia. Adults residing in rural and urban regions of Malaysia and Indonesia ($n = 2073$, 51% Malaysia, 49% Indonesia; 55.5%) were recruited by a social research company (Dynata) utilizing an online panel. This sample size is sufficient for regression-based analyses (Tabachnick and Fidell, 2007). The participant selection process targeted a representative sample based on gender and age. Sampling was targeted geographically, to ensure at least one third of respondents were from orangutan range regions (i.e. Malaysian Borneo, and Kalimantan and Sumatra in Indonesia). Suitable participants were emailed and invited to participate. Following institutional ethical clearance for compliance with the National Statement on Ethical Conduct in Human Research (approval number 2019/HE000097), the 15-minute, online survey (Appendix S1) was administered in June 2019.

2.3. Dependent variables – Conservation support

2.3.1. Policy support

Seven questions assessed support for orangutan protection strategies: (i) Policies requiring farmers and companies to report orangutans on their land, rather than harming or removing them; (ii) Stronger penalties for people who kill, trade, or keep orangutans; (iii) Restrictions on certain ways of clearing land or harvesting timber in areas where orangutans live; (iv) Employing rangers to monitor activities in areas where orangutans live; (v) Financial support for local farmers who protect trees on their land; (vi) Restricting the expansion of palm oil plantations; and (vii) Providing training for communities to enable employment that does not harm orangutans. These items were rated on a 5-point scale (1 = I would not support this, 5 = I would definitely support this). The mean of these items formed a 'policy support' score (Cronbach's $\alpha = 0.87$). Cronbach's alpha is a measure of scale reliability, where $\alpha > 0.7$ indicates adequate reliability (Field, 2013).

2.3.2. Willingness to act - for general environment

Participants were asked to rate their willingness to complete a range of actions in order to help an environmental problem near their home: (i) Attend a public meeting; (ii) Support leaders taking action; (iii) Support others in my community taking action; (iv) Make an effort to change my daily routine; and (v) Put up with some inconvenience in my daily life. Each item was rated on a 4-point scale (1 = definitely unwilling, 4 = definitely willing); the mean formed a 'Willingness to act for the environment' score (Cronbach's $\alpha = 0.87$).

2.3.3. Willingness to act - for orangutans

Two questions rated willingness to do something differently in daily

life to help orangutans and attend a public meeting about orangutans. Items were rated on a 4-point scale (1 = definitely unwilling, 4 = definitely willing); the mean formed a 'Willingness to help orangutans' score (Cronbach's $\alpha = 0.77$).

2.4. Independent variables – components of wellbeing

Wellbeing indicators were adapted from the World Values Survey (Inglehart et al., 2014) to represent diverse conceptualisations of wellbeing. Our measures included basic biological through to higher order psychological dimensions of wellbeing.

- **Basic needs:** Three items asked whether respondents had gone without: (i) Food to eat; (ii) Necessary medicine or medical treatment; or (iii) Cash income in the previous year. These were measured on a 4-point scale (1 = never, 4 = often). Because 'going without' may act as a threshold effect (as opposed to a spectrum effect), the variable was binary coded for analysis where 1 = having all basic needs met (never/rarely going without for all items), and 0 = going without sometimes/often for at least one item.
- **Subjective Health:** One item asked participants to rate their overall state of health. Responses were measured on a 4-point scale (1 = poor, 4 = very good).
- **Feeling Safe:** A single item assessed perceived safety by asking how often respondents have felt unsafe from crime within the last 12 months. This was measured on a 4-point scale (1 = never, 4 = often), and recoded for analysis so that higher scores represent higher perceived safety.
- **Absence of worry:** Four items assessed how often respondents felt worried about (i) Employment; (ii) Child's education; (iii) War; and (iv) Family health. These were measured on a 4-point scale (1 = never, 4 = often). For analysis, these were reverse coded and averaged, where higher mean scores reflected absence of worry (Cronbach's $\alpha = 0.77$).
- **Participation:** six items assessed participation in a range of organisations including (i) Church/religious organization; (ii) Sport, recreation or cultural organization; (iii) Political party; (iv) Environmental organization; (v) Other, and (vi) Whether the respondent had attended a public meeting about a local issue. For analysis, a participation score was derived by counting the number of positive responses.
- **Agency:** A single item assessed whether participants felt a sense of choice and control over their life (1 = no choice at all, 10 = a lot of choice)
- **Happiness:** A single item assessed happiness on a 4-point scale (1 = not at all happy, 4 = very happy)

2.5. Participant characteristics

Two spatial variables were used as moderators:

- **Country of origin** (derived from survey metadata, coded as Indonesia = 1, Malaysia = 0)
- **Orangutan region:** derived from survey metadata, region was recoded for analysis into a binary variable (orangutan region or not). Indonesian respondents were classified as living in an 'orangutan region' if they lived in Kalimantan or Sumatra, and for Malaysian respondents, those who lived in Borneo (Sabah and Sarawak) were classified as living in an orangutan region.

Additional sociodemographic information collected include: age (continuous), gender (1 = male, 0 = female or other), university education (1 = yes, 0 = no), religion (6 options, recoded for analysis as 1 = Muslim, 0 = other).

2.6. Statistical analysis

A linear regression model was constructed for each dependent variable. The initial model included the following fixed effects: all eight independent variables, both moderators (country of origin, orangutan region), covariates (age, sex, country, religion) and two-way interactions between independent variables and moderators. The optimal fixed structure was determined via an iterative process removing the least significant factor at each step, according to Akaike Information Criterion (Akaike, 1974) and maximum likelihood (ML) estimation. Once the final model was identified, it was refitted using restricted ML estimation (REML) (Zuur et al., 2009). Models were checked for normality assumptions by inspecting normality of residuals and for multicollinearity (all tolerance levels > 0.25).

3. Results

3.1. Sample characteristics

Surveys were completed by 2073 participants (n = 1016 Indonesia, and n = 1057 Malaysia). Table 1 shows descriptives of all variables across Indonesian and Malaysian residents. All age groups were represented and 51.3% were female. Just over 60% of participants from both countries reported having attended university (Table 1, Appendix S2). The median age of sample was marginally higher than that of the national populations (our sample had a median age of 33 years against the national value of 29.4 for Indonesia, and a median age of 33 years against the national value of 29.9 for Malaysia) (World Economics, 2022a, 2022b). Our higher median age is likely attributable to the fact that our sample did not include people under the age of 18.

Table 1
Descriptives of variables across Indonesian and Malaysian respondents. Continuous variables are reported as mean ± standard deviation (range); categorical variables presented as frequencies.

Variable type	Variable	Indonesian respondents n = 1016	Malaysian respondents n = 1057
Dependent variables	Policy support	4.31 ± 0.84 (1–5)	4.38 ± 0.77 (1–5)
	Willingness to act- general environment	3.27 ± 0.68 (1–4)	3.09 ± 0.61 (1–4)
	Willingness to act- for orangutans	3.31 ± 0.69 (1–4)	3.09 ± 0.64 (1–4)
Independent variables	Basic needs met	43.8% had rarely or never gone without basic needs being met (1–4)	50.33% had rarely or never gone without basic needs being met (1–4)
	Subjective health	3.04 ± 0.87 (1–4)	2.80 ± 0.74 (1–4)
	Feeling safe	3.35 ± 0.87 (1–4)	2.86 ± 0.91 (1–4)
	Absence of worry	2.12 ± 0.88 (1–4)	2.43 ± 0.81 (1–4)
	Participation	3.33 ± 1.86 (1–6)	2.97 ± 1.96 (1–6)
Covariates	Agency	7.38 ± 2.41 (1–10)	6.26 ± 2.06 (1–10)
	Happiness	3.24 ± 0.67 (1–4)	2.86 ± 0.69 (1–4)
	Age	44.69% < 30 years; 46.56% 31–49 years; 8.76% > 50 years (34.13 ± 11.12)	44.84% < 30 years; 38.79% 31–49 years; 16.37% > 50 years (35.14 ± 12.53)
	Gender	50% female	52.51% female
	Education	63.09% university education	63.10% university education
Moderator	Religion	80.41% Muslim	50.99% Muslim
	Orangutan region	80% from orangutan region	32% from orangutan region

3.2. Policy support

Over half of participants (55.86%) reported being ‘definitely willing’ to support environmental policy. Greater policy support was positively related to not going without (B=0.12, 95% 0.05–0.19), absence of worry (B=0.11, 95% 0.07–0.14), and feeling a sense of agency (B=0.13, 95% 0.09–0.16). The effect of feeling safe (B=−0.08, 95% −0.15 to −0.01) was moderated by country, where a positive relationship between safety and policy support was only observed in Indonesian respondents (Table 2, Fig. 2a).

3.3. Willingness to act: environment

About a third of participants (33.1%) reported being definitely willing to act for the environment. Increased willingness to act for the environment was positively related to feeling safe (B=0.05, 95% 0.02–0.08), absence of worry (B=0.11, 95% 0.08–0.14), participation (B=0.10, 95% 0.08–0.13), feeling a sense of agency (B=0.13, 95% 0.10–0.16), and happiness (B=0.04, 95% 0.01–0.07). Having basic needs met was moderated by respondents’ country (B=−0.19, 95% −0.28 to −0.09) and was associated with greater willingness to act in Indonesian respondents only, with minimal influence in Malaysian respondents (Table 2, Fig. 2b).

3.4. Willing to act: orangutans

Most respondents reported being ‘probably’ (48.44%) or ‘definitely’ (43.08%) willing to help orangutans. Willingness to act to help orangutans was positively related to having needs met (B=0.09, 95% 0.03–0.14), absence of worry (B=0.09, 95% 0.06–0.12), agency (B=0.11, 95% 0.07–0.14), and happiness (B=0.04, 95% 0.00–0.08). The effects of feeling safe (B= −0.09, 95% −0.15 to −0.04) and participation (B=−0.09, 95% −0.15 to −0.04) were moderated by country, where the strongest positive effects were observed in Indonesian respondents (Table 2, Figs. 2e and 2f). The effect of health was moderated both by country (B=0.07, 95% 0.01–0.13) and whether respondents lived in orangutan regions (B=0.08, 95% 0.01–0.14). Despite a positive bivariate correlation (Appendix S2), model estimates suggest that subjective health was associated with lower willingness to act for orangutans. This negative relationship was more pronounced in Indonesian respondents, and those living in regions without orangutans (Table 2, Fig. 2c and 2d).

4. Discussion

Our study reveals that different components of wellbeing are related to public opinions supportive of conservation in Indonesian and Malaysian citizens. Consistent with our hypotheses, we observed that both physical and psychological wellbeing are important for all three forms of conservation support: policy support, willingness to act for the environment, and willingness to act for orangutans (Fig. 3). A range of wellbeing dimensions (having basic needs met, feeling safe, being free from worry about fundamental requirements, and a sense of agency) were positively associated with all three of our measures of public opinion about conservation. Our findings build on the literature in several ways: rather than restricting focus to the village level, or relying on simplistic constructs of wellbeing, our study explored a diverse range of wellbeing indicators across a national cohort to understand how they interact with support for conservation. Our findings show that individual wellbeing is associated with conservation support at a national scale.

There is limited empirical research on how wellbeing impacts engagement with conservation issues. However, our finding that a range of biological and psychological dimensions of wellbeing are important precursors for conservation support is reflected in the broader psychological literature. Our findings are consistent with Maslow’s Hierarchy of Needs (Maslow, 1943; Maslow, 1987; Maslow et al., 1998) as well as other theories that suggest that physical and psychological needs must

Table 2

Mean (\pm standard error) coefficients for individual wellbeing parameters and interactions between wellbeing parameters in their association with (i) Policy support; (ii) Willingness to act for the general environment; and (iii) Willingness to act for orangutan conservation across Indonesian and Malaysian participants.

	Policy support		Willingness to act			
	Coefficient (\pm SE)	%CI	For environment		For orangutans	
Coefficient (\pm SE)			%CI	Coefficient (\pm SE)	%CI	Coefficient (\pm SE)
Basic needs met	0.12 \pm 0.04 **	0.05, 0.19	0.36 \pm 0.08 ***	0.20, 0.52	0.09 \pm 0.03 **	0.03, 0.14
Subjective health					-0.16 \pm 0.06 **	-0.27, -0.04
Feeling safe	0.18 \pm 0.05 **	0.07, 0.28	0.05 \pm 0.01 ***	0.02, 0.08	0.20 \pm 0.05 ***	0.11, 0.29
Absence of worry	0.11 \pm 0.02 ***	0.07, 0.14	0.11 \pm 0.01 ***	0.08, 0.14	0.09 \pm 0.02 ***	0.06, 0.12
Participation			0.10 \pm 0.01 ***	0.08, 0.13	0.27 \pm 0.05 ***	0.18, 0.36
Agency	0.13 \pm 0.02 ***	0.09, 0.16	0.13 \pm 0.02 ***	0.10, 0.16	0.11 \pm 0.02 ***	0.07, 0.14
Happiness			0.04 \pm 0.02 **	0.01, 0.07	0.04 \pm 0.02 *	0.00, 0.08
Age	0.01 \pm 0.00 ***	0.01, 0.01	0.01 \pm 0.00 ***	0.01, 0.01	0.01, 0.00 ***	0.00, 0.01
Gender	-0.14 \pm 0.03 ***	-0.21, -0.08	-0.13 \pm 0.03 ***	-0.18, -0.08	-0.11 \pm 0.03 ***	-0.16, -0.05
Religion			0.10 \pm 0.03 ***	0.05, 0.16	0.07 \pm 0.03 *	0.01, 0.13
Education	0.33 \pm 0.03 ***	0.28, 0.39	0.16 \pm 0.02 ***	0.12, 0.21	0.17 \pm 0.02 ***	0.12, 0.21
Country (Indonesia=1, Malaysia=0)	0.10 \pm 0.04 **	0.03, 0.17	0.01 \pm 0.04	-0.06, 0.08	-0.07 \pm 0.03 *	-0.13, 0.00
Orangutan region (Yes=1, No=0)					0.12 \pm 0.03 ***	0.06, 0.18
Safety x country	-0.08 \pm 0.03 *	-0.15, -0.01			-0.09 \pm 0.03 **	-0.15, -0.04
Happiness x country						
Basic needs met x country			-0.19 \pm 0.05 ***	-0.28, -0.09		
Participation x country					-0.09 \pm 0.03 **	-0.15, -0.04
Subjective health x country					0.07 \pm 0.03 *	0.01, 0.13
Subjective health x orangutan region					0.08 \pm 0.03 *	0.01, 0.14

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.00$

be met before an individual can engage with broader issues (Evensen et al., 2021; Shafir, 2014; Spears, 2011), such as environmental conservation. Four of our wellbeing indicators were significant associated with all three outcomes: having basic needs met, feeling safe, being free from worry, and a sense of agency. The first three of these indicators reflect basic physical dimensions of wellbeing and are essential building blocks for broader physical and psychological wellbeing (Maslow, 1943; Maslow, 1987; Maslow et al., 1998; Summers et al., 2012). Psychological theory highlights the importance of agency, and a sense of autonomy and freedom to determine one's own actions (Deci and Ryan, 2000; Ryan and Deci, 2000). Agency is central to making choices that are aligned with one's values, particularly for people living in poverty (Hicks et al., 2016; Ibrahim and Alkire, 2007). Overall, these findings suggest that a diverse range of basic and higher-level wellbeing indicators may be important for enabling individuals to express active support for conservation initiatives.

We observed that our two action-related outcomes—willingness to act for orangutans and the general environment—were associated with a broader range of wellbeing dimensions than policy support. The additional wellbeing dimensions associated with our action outcomes included happiness and participation. Happiness is a fundamental measure of psychological wellbeing and is conceptualised in most wellbeing frameworks (Inglehart et al., 2014; Narayan and Walton, 2000; OECD, 2011; WHO, 2012). Social connection and participation have also been identified as important aspects of wellbeing (Summers et al., 2012), which can shape healthy development (Immordino-Yang et al., 2019), and enable engagement in environmental action (Atshan et al., 2020). The fact that more components of wellbeing were required for action outcomes may speak to the passive nature of policy support, or in the case of our survey, willingness to support policy. Our action oriented outcomes are more likely to reflect 'issue salience', where an individual not only 'agrees with' statements about policies, but indicates a willingness to actively engage in the issues at hand (Bromley-Trujillo and Poe, 2020; Burstein, 2003). As such, additional social resources such as those represented in our wellbeing indicators might be required to elicit issue salience, and enable individuals to engage in active support for policies required to influence policy development.

While our findings reinforce the relationship between aspects of wellbeing and conservation support, the pattern of these results indicate that not all components of wellbeing operate uniformly. Contrary to expectations, a subjective assessment of health exhibited a negative

association with conservation support. We recommend caution in interpreting this finding. Given the positive pairwise correlation between health and willingness to support conservation, the negative relationship that emerged in our final model may indicate that health is modifying other stronger relationships between wellbeing and conservation support. Nonetheless, these results imply that when compared to other wellbeing components, subjective health is less likely to represent a dominant positive influence on our outcomes. While we would not argue that pursuing health outcomes undermines support for conservation, this finding does serve to remind us that we cannot assume indicators of health will automatically and directly enable individuals to engage more deeply with conservation initiatives. This is an important consideration, as various organisations across Indonesia and Malaysia invest in health to achieve positive social and conservation outcomes. Existing studies focus on health services delivered alongside conservation interventions, with few delving into the interactions between community health and conservation outcomes. For example, a study by Allgood et al. (2019) examined numerous successful community-based wildlife conservation projects that provide health services but did not measure the interaction between health and conservation outcomes such as conservation support. While several of their case studies report positive conservation and health outcomes, most of this data was provided by project managers and the study only included 'successful' projects. This provides an example of how the narrative linking health with positive conservation outcomes in the literature could also reflect a bias towards reporting success stories and not failures. A study by Dang et al. (2020) did measure associations between subjective health and support for a large payment for ecosystem services program in China. Specifically, they surveyed program participants and non-participants (total 389 households) and reported that subjective health was associated with positive perceptions about program benefits (environmental, financial and social). Interestingly, one study has reported complex relationships between health and conservation outcomes: providing health and family planning services in Madagascar created stronger pressures on fishing resources (Singleton et al., 2019). Further research would be useful to better understand the relationship between health and conservation support.

Moderation analysis indicated that some positive relationships between wellbeing and conservation support were stronger in Indonesian respondents than those from Malaysia. One possible explanation relates to differences in the social-ecological context. For example, a strong

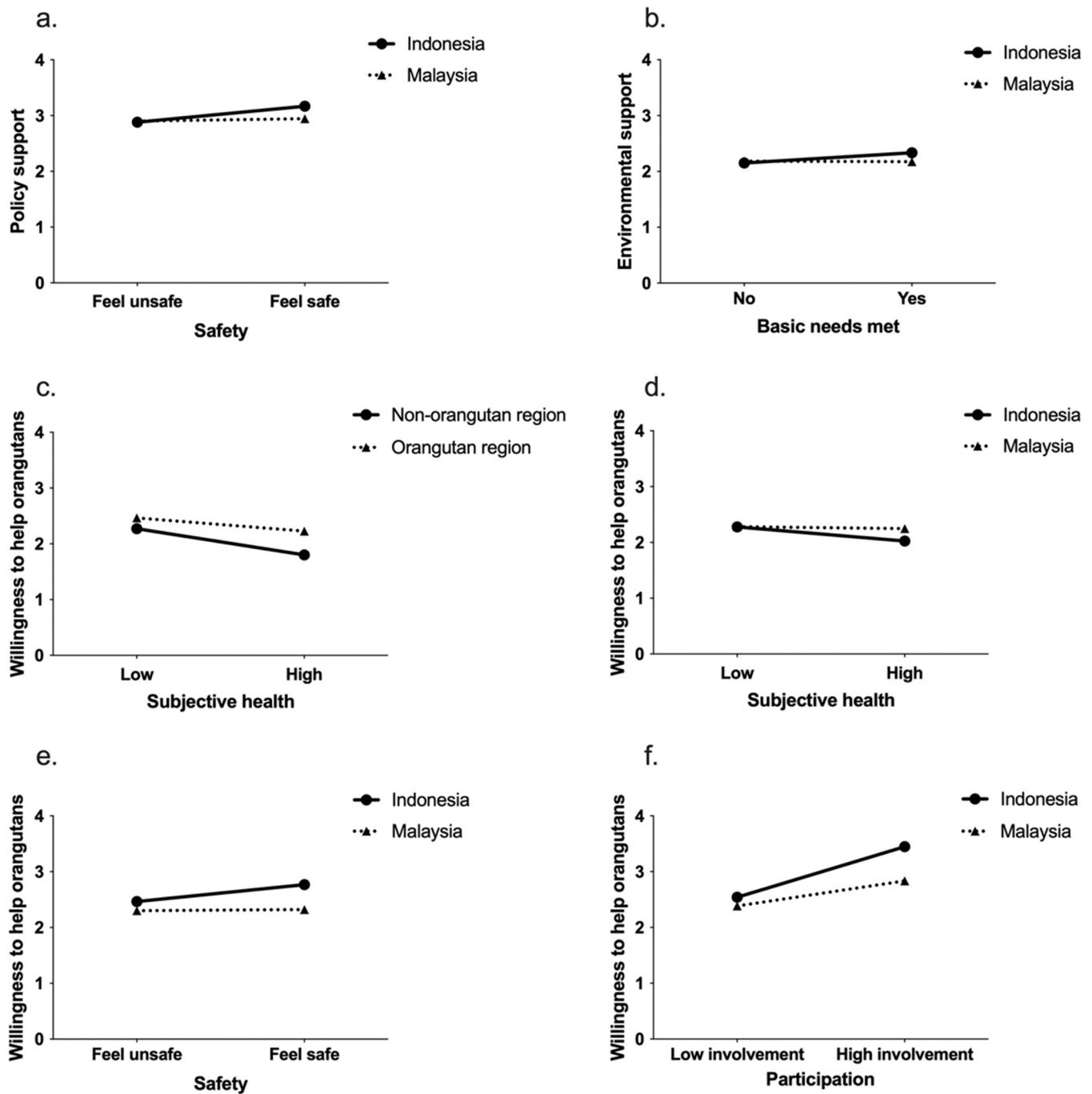


Fig. 2. Significant interactions identified in Table 1: (a) the impact of safety on willingness to support policy was moderated by country; (b) the relationship between having one’s basic needs met and being willing to act to support the environment was moderated by country; (c) the relationship between subjective health and willingness to act to help orangutans is moderated by whether respondents lived in an orangutan region or not; (d) the relationship between subjective health and willingness to act to help orangutans is moderated by country; (e) the relationship between safety and willingness to act to help orangutans is moderated by country; (f) the relationship between participation in social groups and willingness to act to help orangutans is moderated by country.

perception of orangutans as a national icon in Malaysia (Ancrenaz et al., 2007) may engender greater acceptance of links between conservation and tourism livelihoods. Democratic processes and norms vary between Indonesia and Malaysia, where Malaysia has more centralised governance systems (Lauth, 2020). As such, Indonesians may hold different beliefs about individual capacity to influence systems. In addition, while Indonesia is home to greater numbers of orangutans, it continues to experience ongoing deforestation and pressures related to land use policies (Austin et al., 2019; Gaveau et al., 2019). These challenges may result in great variation in population support for conservation, and

greater dependence of this support on social aspects such as wellbeing. Another factor that may influence the differences observed between countries relates to the level of investment in health and social services. Compared to Indonesia, Malaysia directs more resources to health and social welfare (The World Bank, 2020a, 2020b). This could buffer the influence of wellbeing on conservation support and may result in Malaysians perceiving less of a trade-off between conservation support and social wellbeing.



Fig. 3. Summary of key research findings: what elements of wellbeing positively increase intended conservation support (increased policy support, willingness to act to support the environment, willingness to act to help orangutans).

4.1. Implications for practice

Our findings suggest that wellbeing is a necessary precursor to conservation support. It is generally accepted that conservation projects should consider social needs, but most of the dialogue around this relates to village-level projects (Alexander et al., 2016; Berkes, 2004). Conservation instruments are also deployed at a national scale, and our findings suggest that policy and national investment decisions should also be attuned to social needs. This is likely to be particularly important when conservation requires overwhelming social acceptability to support investment in programs, or a change in community behaviour, such as reduced consumption of wildlife products or unsustainable palm oil (Amel et al., 2017; Nilsson et al., 2020). Our findings suggest that when considering wellbeing at a population level, targeting simple constructs such as poverty or access to food is important, but likely to miss important elements of wellbeing. Instead, conservation support seems to interact with a broader notion of wellbeing— one that involves living an enriching life.

For some environmental policy areas—especially related to climate change—it is becoming more conventional to integrate human wellbeing into policy-making (e.g. Tommoy et al., 2020). However, this is not

typical for biodiversity conservation, with many conservation organisations lacking the resources or remit to focus on human wellbeing. To begin, we suggest it would be useful for conservation organisations and advocates to understand the social setting in which they operate and examine how social issues intersect with conservation issues. For example, practitioners should acknowledge variation in the human social context across their target species' range. This could enable more strategic distribution of investment and the adjustment of expected outcomes to align with the relevant social and political context. Such a social-ecological approach to conservation is vital to meet ethical obligations and to improve conservation practice through an understanding of how social factors enable or constrain conservation outcomes. However, we recognise that project budgets, resources and targets vary, and not all conservation projects can include a social focus. Large NGOs and research institutions are well placed to examine the social-ecological context at a national or regional scale to inform better policies, while smaller projects could partner with social development programs to understand the local scale in which they work. Policymakers must consider social needs when designing conservation policies. We acknowledge the practical challenges associated with this, as the decision-making process is complex, and influenced by a broad range of

factors, including political ones. Moreover, the short timescales over which policy decisions occur might not align with the timescales required to make social or conservation change.

4.2. Limitations

There are several caveats to our study. Our survey was cross-sectional, and as such, the associations between wellbeing and conservation support may not reflect causal relationships. There is a chance that variables not captured by our study could be the primary drivers of the correlation between human wellbeing and intention to support conservation or take action. Furthermore, we focused on public opinion and willingness to take action, but we did not measure specific behaviours. Future studies could build on this by examining behaviours that may support the relationship between public opinion and policy-making, such as information sharing and civic engagement, and what factors shape these behaviours. It would be useful for future research to examine how relationships between wellbeing and conservation support vary in a broader range of geographic contexts. This could provide useful insights around how different cultural settings and economic indicators interact with a broad range of conservation issues. Finally, our sample was recruited via a social research company's online panel. While this provides access to a large range of the population not typically sampled in conservation research, it is more likely to capture urban residents, with higher levels of literacy and access to internet, which corresponds to high rates of university education in our sample (>60%, compared to national estimates of Indonesia = 36.3% and Malaysia = 45.1% (UNESCO, 2020a, 2020b)). All analyses reported in this study statistically controlled for the influence of education, and as such reflect associations that are independent of education. Nonetheless, future research with greater representation of rural communities would be useful to better understand interactions between wellbeing and conservation support within rural populations in Indonesia and Malaysia. Importantly, we note that the aim of our study was not to determine national rates of conservation support (which would require more representative samples), but to examine how variation in support is influenced by variation in wellbeing. Future research with greater representation of rural communities would complement our study. This would allow for more nuanced examination of how the relationship between wellbeing and conservation support might vary according to social factors such as forest-dependence.

4.3. Conclusion

Wellbeing is important for conservation support in Indonesia and Malaysia. Our findings support the assumption that when basic physical and psychological dimensions of wellbeing are satisfied, people are more likely to express public opinions more supportive of conservation and willingness to actively engage in these issues. Our findings highlight the importance of considering human wellbeing in conservation policy-making. To prevent further declines of the three critically endangered orangutan species, conservation actors should consider not only the ecological context in which orangutans survive, but also the social context in which they operate. This involves considering the wellbeing of people not just at local scales, but at regional or national scales. Our study offers unique insights by highlighting that various components of wellbeing can shape conservation support at national scales. Such knowledge can aid conservationists to more effectively address conservation issues in a holistic manner, addressing both social and ecological aspects of the system, which we know is important for sustainable solutions. Our study outlines the importance of a variety of wellbeing components, suggesting that simplistic constructs of wellbeing, such as health, might not capture the ingredients of wellbeing that shape conservation support. This information can help direct investment, by demonstrating the importance of approaching wellbeing as a multi-dimensional construct, instead of assuming that investment in a

simplistic measure of wellbeing will improve conservation support. Our findings highlight opportunities for conservation actors to invest in people to improve conservation outcomes. Investment in relevant dimensions of wellbeing might be a key constituent of effective and sustainable conservation solutions.

CRediT authorship contribution statement

Emily Massingham: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Kerrie Wilson:** Conceptualization, Funding acquisition, Supervision, Writing – review & editing. **Erik Meijaard:** Writing – review & editing. **Marc Ancrenaz:** Writing – review & editing. **Truly Santika:** Writing – review & editing. **Rachel Friedman:** Visualization; Writing – review & editing. **Hugh Possingham:** Supervision, Writing – review & editing. **Angela J Dean:** Conceptualization, Supervision, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – review & editing.

Declaration of Competing Interest

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.

Data Availability

Data will be made available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.envsci.2023.103588](https://doi.org/10.1016/j.envsci.2023.103588).

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