

A Meta-Analysis of the Relationship Between Place Attachment and Pro-Environmental Behaviour

Abstract

Place attachment has been identified as a key construct that can explain pro-environmental behaviour. However, the precise strength of its effect remains undocumented. The aim of this article is to quantify the effects of place attachment on pro-environmental behaviour by means of a meta-analysis and to examine the contextual factors that may explain the variations in the effect sizes reported in previous research. Our results show that, first, the overall effect of place attachment on pro-environmental behaviour is positive, and the strength of the effect is moderate. Second, the effect is larger in collectivist vs. individualist cultures. Third, the effect also depends on the type of place user and is larger for tourists vs. local residents. Fourth, the general measure of place attachment produces a larger effect size than measures focusing on one of its dimensions. Finally, place-specific measures of pro-environmental behaviour produce a larger effect size than non-place-specific ones.

Keywords

Meta-analysis, place attachment, pro-environmental behaviour, culture, place user

1. INTRODUCTION

Extant research has identified various factors that affect pro-environmental behaviours. One of the factors is place attachment, defined as the cognitive and affective bond that people have with a place (Scannell & Gifford, 2010a; Lewicka, 2011). The rationale is that the attachment to a place fosters a sense of belonging, which promotes engagement in civic activities including pro-environmental behaviour (Uzzell, Pol & Badenas, 2002; Manzo & Perkins, 2006; Anton & Lawrence, 2014).

However, despite the increasing research attention on the link between place attachment and pro-environmental behaviour (e.g., Meloni et al., 2019; Song et al., 2019), the variances across individual studies have made it difficult to ascertain the overall impact of place attachment in promoting environmentally friendly behaviours. Specifically, extant empirical studies have provided inconsistent results indicating either a positive (e.g., Buta et al., 2014; Cheng & Wu, 2015), null (e.g., Ramkissoon et al., 2013b; Tonge et al., 2015) or negative (e.g., Uzzell et al., 2002; Junot et al., 2018) relationship between place attachment and pro-environmental behaviour. These divergent findings could be due to the differences in their research designs. Indeed, previous research on the link between place attachment and pro-environmental behaviour has been conducted in various cultural contexts, among distinct groups of individuals, and with different scales to measure place attachment and pro-environmental behaviour. Thus, questions arise as to whether these contextual and operational differences might account for the variations in the previous findings on the attachment-behaviour relationship.

As previous researchers have pointed out, empirical results from individual studies vary due to their non-comparable designs and measures and are not sufficient to provide solutions for a research question (Wells, 2001; Hunter & Schmidt, 2004). Thus, a systematic evaluation

of how place attachment affects pro-environmental behaviour is needed to establish generalisations about the magnitude and boundary conditions of this attachment-behaviour relationship. Such an integrative insight will also provide further implications for public policy makers in using place attachment policy to encourage pro-environmental engagement.

In this research, we conduct a meta-analysis study of past literature on the effect of place attachment on pro-environmental behaviour. Our contention is that a meta-analysis study is needed to clarify the nature of the relationship between place attachment and pro-environmental behaviour. Common to any meta-analysis studies, our main goal is to examine the size and the direction of the focal relationship being studied and the potential contextual factors that affect the relationship. That is, we address the following main research questions: what is the size and the direction of the effect of place attachment on pro-environmental behaviour? And what are the contextual factors that might influence the effect?

Our specific reasons for conducting the meta-analysis of place attachment and pro-environmental behaviour are three-fold. First, findings in this domain are contradictory in terms of the direction and strength of the attachment-behaviour relationship. The aforementioned studies that show a negative or null effect of place attachment on pro-environmental behaviour demonstrate that individuals with strong attachment to a place tend to feel satisfied with the environment status quo, thus leading to no or lower tendency to behave environmentally (e.g., Junot, et al., 2018; Tonge, et al., 2015). It could be misleading to generalise the findings of some individual studies that find positive attachment-behaviour links without considering other studies that provide different or even opposite evidence. Therefore, there is a need to quantify the summary of the effect with a meta-analysis study with the aim of gaining a better understanding about the magnitude and direction of the effect of place attachment on pro-environmental behaviour.

Second, although empirical studies across various research contexts have increased the generalisability of the attachment-behaviour association, there is also increasing heterogeneity in the findings with regard to the magnitude and direction of this link (e.g., Scannell & Gifford, 2013; Song, et al., 2019), which could be due to the differences in the study profiles. For instance, prior studies have used samples of different cultures and different types of respondents (e.g., tourists vs. residents). Therefore, it is important to know about whether or how these cultural and individual factors affect the link between place attachment and pro-environmental behaviour.

Third, extant literature has indicated that global vs. specific measures of constructs are not equivalent and may have different consequences on attitudes and behaviours (e.g., Rosenberg et al., 1995). For example, Rosenberg et al. (1995) discover that global vs. specific self-esteem have differential effects on well-being and performance measures. In our survey of the literature on the link between place attachment and pro-environment behaviour, we discover that different studies have operationalised place attachment and pro-environment behaviour differently, in ways that can be categorised into either global or specific measures. For the operationalisation of place attachment, some researchers have used a global measure, which is a one-dimensional self-reported scale (e.g., Lewicka, 2005; Hernández et al., 2007). Recently, however, place attachment has been operationalised as a multidimensional construct comprising place dependence, place identity, place affect and place social bonding (e.g., Ramkissoon et al., 2013b). As some researchers have pointed out, one possible explanation for the discrepant findings on the attachment-behaviour relationship may be the different ways place attachment has been defined and measured across individual studies (Scannell & Gilford, 2010a; Ramkissoon et al., 2013b). For pro-environmental behaviour, some researchers use a global behaviour construct without distinguishing types of behaviour (e.g., Lee, 2011; Scannell & Gifford, 2013), while others focus on specific types of pro-environmental behaviour based

on the authors' own categorisation (e.g., Ramkissoon et al., 2013a; Tonge et al., 2015). Thus, a generalisable research effort is needed to understand not only the effectiveness of place attachment on pro-environmental behaviour, but also whether the effect is more profound on generally versus specifically defined pro-environmental behaviour. Our meta-analytic study will assess to what extent these various measurements contribute to the variations in the reported effects of place attachment on pro-environmental behaviour.

We begin our paper by providing a brief overview of place attachment theory and its measurement. Next, we discuss discrepant findings of previous research. Then we present our meta-analysis procedure. In the subsequent section, we discuss the results of our analysis. Finally, we conclude by discussing the key findings and providing research implications.

2. LITERATURE REVIEW AND THE CONCEPTUAL FRAMEWORK

2.1 Place attachment

Place attachment, or sense of place, is the cognitive and emotional bond between people and places (Tuan, 1977; Scannell & Gifford, 2010a; Lewicka, 2011). This people-place bond emerges from people's interaction with a place and their social-interactions that occur in that place (Scannell & Gifford, 2014). For example, residents develop attachment to their residential environment and neighbourhood through daily activities. Similarly, tourists can become attached to a tourist destination through recreational activities and social experiences in relation to that destination (Eisenhauer et al., 2000).

Previous literature has documented various conceptualisations and measurements of place attachment (see Lewicka, 2011 and Hernandez et al., 2014 for extensive discussions). While Lewicka (2011) and Hernandez et al. (2014) have provided extensive discussions on the theoretical and methodological aspects of place attachment, there is a void in looking at the

measurement consistency of place attachment in the context of pro-environmental behaviour. Indeed, our literature review on the studies focusing on the impact of place attachment on pro-environmental behaviour shows that researchers operationalise place attachment differently, and this inconsistency is pervasive even after Lewicka (2011) and Hernandez et al.'s (2014) call for definitional and measurement coherence.

There have been two major approaches in measuring place attachment. One approach is to operationalise place attachment as a global concept, describing people's general connection or feelings to a place (Stedman, 2002). The other approach is to consider place attachment as a multi-dimensional construct, although there is no consistency in terms of the number and type of dimensions being used. For instance, some researchers use two dimensions of place attachment, which include place identity (i.e. symbolic meaning of the place) and place dependence (i.e. functional evaluation of the place) (e.g., Buta et al., 2014; Hsueh, 2018; Larson et al., 2018). More recently, a comprehensive definition of place attachment has been introduced and operationalises place attachments as a four-dimensional construct with place identity, place dependence, place social bonding (i.e. sense of belonging or membership to a group of people within a place), and place affect (i.e. individual's sentiments or "love" towards a place) (Ramkissoon et al. 2013b; Ramkissoon & Mavondo 2015).

While the above operationalisations reflect the psychological aspects of place attachment, other researchers conceptualise place attachment from the perspective of place as an object of attachment. For example, Scannell and Gifford (2010b) differentiate between natural and civic attachment. The former refers to the scenic aspects of a place and the latter the civic aspects of a place, including social interactions that occur in the place.

In an attempt to provide a coherent and comprehensive operationalisation of place attachment, Scannell and Gifford (2010a) propose a tripartite model of place attachment, which

organises place attachment related concepts into a tripartite framework of person, process and place. They argue that place attachment is a multi-dimensional concept with person, psychological process and place as its dimensions. The person dimension represents the extent to which attachment is determined by individually and collectively held meanings. The process dimension manifests people's affective, cognitive and behavioural responses with respect to attachment. Lastly, place refers to the characteristics of a place as the object of attachment.

2.2 Pro-environmental behaviour

One potential behavioural consequence of place attachment is the tendency to exhibit pro-environmental behaviour (Lewicka, 2011), and hence there has been research on pro-environmental behaviour in the place attachment literature. The majority of these studies have used various forms of self-reported behavioural measures for pro-environmental behaviour. Some research relies on a general assessment of people's tendency to engage in pro-environmental behaviour and uses multiple-item scales (e.g., Halpenny, 2007; Takahashi & Selfa, 2015). Others distinguish different types of behaviours or focus on a specific type of pro-environmental behaviour, following various criteria for categorization. For instance, Ramkissoon et al. (2013a) and Song and Soopramanien (2019) make a distinction between high-effort and low-effort behaviour according to the different levels of effort or commitment required by the behaviour. Walker et al. (2015) categorise pro-environmental behaviour into three types of behaviour: individual behaviour, collective behaviour and policy support behaviour. Halpenny (2007) categorises pro-environmental behaviour into general vs. place specific, depending on whether the behaviour is targeted at a specific place or not.

2.3 The relationship between place attachment and pro-environmental behaviour

Previous literature has used several theoretical perspectives in support of an assumed positive link between place attachment and pro-environmental behaviour. According to place

attachment theory (e.g., Bowlby, 1969; Lewicka, 2011), the emotional bonds people have with a place can generate positive behavioural tendencies to protect the place. Specifically, the attachment to a place can give rise to a sense of individual responsibility toward the environment of that place, and thus encourage activities that contribute to the sustainability of the environment.

Social Identity Theory (SIT) predicts that if individuals identify with a group, they are more likely to behave in the interests of the group (Brown, 2000). Similarly, if an individual is attached to a place and identifies with its community, we would assume that s/he will be more likely to prioritise the interest of the place/community over self-interest (Carrus et al., 2014; Scannell & Gifford, 2014). In particular, someone who is attached to a place may behave pro-environmentally for the benefit of the place even though the pro-environmental behaviour requires more time, effort or monetary input. Indeed, this positive impact of social identification on pro-environmental behaviour has been demonstrated in the literature of common social dilemmas (Kerr, 1995), where identification with a group or a community encourages individuals to act environmentally for the benefit of the group or community.

Consistent with the above theoretical predictions, results of most empirical research have demonstrated that people with a higher level of attachment to a place are more likely to demonstrate pro-environmental behaviour (Stedman, 2002; Ramkissoon & Mavondo, 2017). However, a number of empirical studies also show no or even negative links between place attachment and pro-environmental behaviour (see Table 1A). For example, Uzzell et al. (2002) find that place attachment may not necessarily generate pro-environmental behaviour: "...in Onslow Village, the relationship between place-related social identity and sustainability is much weaker and in a negative direction. In this particular neighbourhood, although place identification contributes substantially to identity it does not in turn lead to pro-environmental

sustainability attitudes” (p.13). The authors argue that individualism might explain the negative relationship: “One explanation of this is that the values tapped into were highly individualistic in Onslow Village resulting in an inward-looking individualism rather than outward community perspective” (Uzzell et al, 2002, p.12). It is also possible that individuals with strong place attachment may under-evaluate the severity of environmental problems of the place and thus do not see the necessity for behaving pro-environmentally (Junot, et al., 2018). In addition, individuals may get attached to a place if it can fulfil their functional, recreational or social goals. As long as these goals are met, people would be easily satisfied with the existing environment conditions and overlook the need to behave environmentally (Ramkissoon et al., 2013b; Tonge et al., 2015).

[INSERT TABLE 1A HERE]

The above discussions demonstrate that place attachment could generate a behavioural tendency to protect and improve the environment, but at the same time may engender a possible oversight over the need to behave environmentally. It is then logical to assume that, when environmental problems are salient (e.g., individuals being reminded of environmental threats to the place), the oversight would disappear, and the positive role of place attachment in promoting pro-environmental behaviour would prevail (Stedman, 2002; Scannell and Gifford, 2013). As concerns over environmental degradation have been widespread in the past two decades, we posit that place attachment would trigger a protective behavioural tendency. Thus, this leads to our prediction that the overall impact of place attachment on pro-environmental behaviour is positive.

2.4 Moderators of the attachment-behaviour relationship

The association between place attachment and pro-environmental behaviour has been tested empirically in diverse contexts, including different cultural settings and among various

types of place users. One research objective of this meta-analysis is to identify the potential contextual moderators for the attachment-behaviour link. Thus, in this section, we draw from the literature of place attachment, cross-cultural studies and tourism to articulate why there may be variances in the impact of place attachment on pro-environmental behaviour across different contexts.

2.4.1 Culture

In a meta-analysis of the psycho-social determinants of pro-environmental behaviour, Bamberg and Möser (2007) call for research attention on the potential moderating role of culture in the relationship between pro-environmental behaviour and its antecedents. Although there has been some research on the direct effects of various cultural dimensions on pro-environmental behaviour (e.g., McCarty & Shrum, 2001), more research is needed to examine whether culture serves as a boundary condition for the link between pro-environmental behaviour and its motivating factors such as place attachment (Scannell & Gifford, 2010a).

Culture contributes to the meaning of place, and thus must be considered for the impact of place attachment on pro-environmental behaviour. As Scannell and Gifford (2010a) point out, attachment to a place evolves at both individual and group levels. Through shared historical, social, and religious experiences in a place, members of a group develop a common symbolic meaning of that place. This cultural aspect of place attachment is intertwined with the attachment at the individual level, where “cultural place meanings and values influence the extent of individual place attachment, and individual experiences within a place, if positive, can maintain and possibly strengthen cultural place attachment” (Scannell & Gifford, 2010a, p.3). As a result, the same type of place may suggest different meanings across cultural groups (e.g., Virden & Walker, 1999) and environmental behaviours towards a place may have specific implications in some cultures (Cheung & Hui, 2018). For example, in some cultures

like China, places are related to *fengshui*, the energy forces that harmonise individuals with their environment, and environmental protection may imply preserving *fengshui* which benefits the people who live in the region (Cheung & Hui, 2018).

Among the cultural dimensions proposed by Hofstede (1980), collectivism-individualism (C-I) has been considered the most important dimension for social behaviour (Triandis, 1989; 2018). The C-I dimension reflects people's priority in face of a conflict between self-interest and group interest—in collective cultures, people feel obliged to give priority to collective interest, whereas in an individualist culture it is permissible to give priority to self-interest (Markus & Kitayama, 2003).

For the relationship between place attachment and pro-environmental behaviour, we predict that the collectivism-individualism cultural dimension plays a moderating role, such that the strength of the link would be different in collective cultures and in individualist cultures. According to place attachment theories, attachment to a place gives rise to behavioural intention to protect or improve the place for the interest of one's in-group that has developed within that place. As Milfont and Markowitz (2016) suggest, pro-environmental decisions are not only the result of individual-level drivers but also constrained or facilitated by broader contextual factors such as culture.

Following social identity theory, identification with a group tends to change one's self cognition from "I" (personal self) to "we" (collective self), and thus increases the tendency to value group interest (Brewer & Gardner, 1996). Accordingly, an individual gets attached to a place in the sense that the place defines who he/she is and represents a community to which she or he belongs. Thus, the attached individual would come to see him or herself more as a member of a social collective in relation to that place and is more likely to value the interest of that place. In particular, collectivists who are attached to a place may have the behavioural

tendency to sacrifice personal interest for the interest of the place (e.g., taking extra time or effort to act environmentally), and this behavioural tendency is consistent with their cultural value where group interest comes first. Hence, the effect of place attachment on pro-environmental behaviour tends to be enhanced in a collective culture. However, for someone in an individualist culture, he or she is more likely to act in an environmentally friendly way to serve personal goals or interest. Although attachment feelings of individualists may generate a behavioural tendency to protect the place, the cultural emphasis on personal goals/gains contradicts this behavioural tendency to sacrifice personal interest for group interest. Hence, the effect of place attachment, constrained by the individualist cultural value, may not be as strong as the one in a collective culture.

As previously mentioned, culture (i.e., individualism) has been offered as an explanation for the negative effect of place attachment on pro-environmental behaviour (Uzzell et al., 2002). In our survey of literature regarding the effect of culture on the magnitude of the place attachment and pro-environmental behaviour link, we have found that the effect sizes vary across collective versus individual cultural contexts (see Table 1B). For example, drawing from a sample of Chinese urban respondents, Song et al. (2019) find that the effect size is quite large ($r = 0.632$). However, in the research by Meloni et al. (2019) using data of Italian urban residents, the effect size is very small ($r = 0.103$).

[INSERT TABLE 1B HERE]

Based on the theoretical and empirical discussions above, we expect that the association between place attachment and pro-environmental behaviour will differ in collective and individual cultures where different priorities are put on group and self-interest.

2.4.2 Place users

The empirical research on the link between place attachment and pro-environmental behaviour mainly focuses on two types of place users, local residents who live in the place (Uzzell et al., 2002; Walker et al., 2015; Song & Soopramanien, 2019) and tourists who visit the place for recreational purposes (Cheng et al., 2013; Ramkissoon & Mavondo, 2015; Tonge et al., 2015). Although the association of place attachment and pro-environmental behaviour applies to both local residents and tourists, the effects may vary across these two types of place users (see Table 1C). For example, drawing from a sample of residents from two rural counties, Larson et al. (2018) find the correlations between place attachment and types of pro-environmental behaviour range from 0.169 to 0.194. Similarly, Song and Soopramanien (2019) report effective sizes between 0.1 and 0.275 among a sample of urban residents. In contrast, the effects of place attachment on pro-environmental behaviour seem larger among tourists. Using a population of tourists to Penghu Islands, Cheng and Wu (2015) report correlations of 0.34–0.5 between place attachment and types of pro-environmental behaviour; Ramkissoon et al. (2013b) find the correlations to be 0.531 and 0.361 among a sample of visitors to Dandenong Ranges National Park.

[INSERT TABLE 1C HERE]

Place attachment predicts pro-environmental behaviour differently depending on how people attach a meaning to a given place and what dimension of place attachment is important to them (Scannell & Gifford, 2014). Similarly, locals and tourists may evaluate and interpret the same place with different meanings and weigh different dimension of place attachment differently.

For tourists, tourism destinations function to serve their experiential and recreational purposes through desired activities such as trail hiking, rock climbing, and museum visits (Kianicka et al., 2006). These activities might contribute to the development of their affective

attachment to the given destination. Previous research in tourism has shown that tourists are more likely to behave in environmentally friendly ways when these desired activities lead to beneficial experiences (Brown et al., 2010). Furthermore, tourists who are attached to a place might develop an anticipated nostalgic feeling about the place they have visited as an attempt to maintain a sense of self-continuity, termed as place-referent continuity (Scannell & Gifford, 2014), which may influence their pro-environmental behaviours in that place.

Compared to tourists, residents develop an attachment to a place through daily activities and social-cultural interactions that is more stable over time (Scannell & Gifford, 2014). Furthermore, residents' routine social interactions that occur in that place and community bonds that develop over time may even serve as important factors that make the residents stay in a given place regardless of the environmental quality of the place.

2.4.3 Measurement scales

Among the studies on the association between place attachment and pro-environmental behaviour, the two focal constructs have been measured as either global or specific. As explained in the introduction, global vs. specific measurement of constructs may have a different effect on attitudes and behaviours. The well-known example for this in the psychology literature is the self-esteem construct (Rosenberg et al, 1995). Thus, we argue that global vs. specific measurements of place attachment and pro-environmental behaviour across different studies may affect the correlations between the two constructs and could account for the discrepant findings in previous studies. We present some samples regarding the measurement scales used in prior studies for place attachment (Table 1D) and for pro-environmental behaviour (Table 1E).

Measurement of place attachment

As depicted in Table 1D, place attachment, as a global construct, has been operationalised in three ways. First, Ramkissoon et al. (2013b) have conceptualised place attachment as a second-order construct and provided the correlation between its composite score and pro-environmental behaviour. Second, some researchers (e.g., Hernandez et al., 2010; Walker, et al., 2015) perceive place attachment as uni-dimensional and use a global measure for the construct. Third, in some research (e.g., Halpenny, 2007; Cheung & Hui, 2018), place attachment is measured with multiple dimensional items. The researchers then calculate the composite score and provide its correlation with pro-environmental behaviour. As a specific construct, place attachment has been operationalised in two ways. Some researchers (e.g., Meloni et al., 2019; Stedman, 2002; Buta et al., 2014) use one of the dimensions of place attachment (i.e., place identity) in their model and provide its correlation with pro-environmental behaviour. Other researchers (e.g., Ramkissoon et al., 2013a; Song et al., 2019) have used multiple dimensions of place attachment in their model. These authors provide the respective correlations and connect each dimension separately to pro-environmental behaviour in their path model.

[INSERT TABLE 1D HERE]

Measurement of pro-environmental behaviour

As depicted in Table 1E, some studies have examined pro-environmental behaviours that are targeted at very specific places. For example, Cheng et al. (2013) examined pro-environmental behaviour towards the Penghu islands, and used items such as "I will try to learn how to solve environmental problems on the Penghu islands" and "I will read the reports or books about the environment of the Penghu islands". Similarly, in exploring the effect of place attachment on urban residents' pro-environmental behaviour towards their city, Song et al. (2019) used measurement of pro-environmental behaviour that specifically targeted at the

respondents' city of residence: "I undertake environmental actions that contribute positively to the image of my city"; "I volunteer for projects, endeavours or events that address environmental issues in my city". In contrast, a number of studies have used a general measurement of pro-environmental behaviour that does not specifically refer to a place (hereafter, general measure and non-place specific measure are used interchangeably). That is, the focal behaviour does not have a clear place as its target, and thus could apply to any place. For instance, Juneman and Rufaedah (2013) used items "In the last 12 months, I avoid buying products from a company that I know may be harming the environment", and "In the last 12 months, I signed and/or circulated a petition (offline/online) in support of protecting the environment". In the same vein, Lee (2011) has used non-place specific measurement items: "I persuade others to adopt pro-environmental behaviors" and "I promote environmental conservation".

[INSERT TABLE 1E HERE]

To compare the effect of place attachment on general versus place-specific behaviour, Halpenny (2007) has used both global and specific measures for pro-environmental behaviour. The author finds out that: "...place attachment was more strongly predictive of place-specific pro-environmental intentions ($\beta = .64$, $p < .001$, $R^2 = .41$) than of general pro-environment behavioural intentions ($\beta = .42$, $p < .001$, $R^2 = .18$). ...In other words, place attachment may be an important factor in fostering individuals' decisions to engage in environmentally responsible behavior. This is especially true for place-related behaviors" (p.64).

Therefore, we argue that since previous studies with different operationalisation of place attachment and pro-environmental behaviour report various magnitudes of correlation, the difference in the measurements of focal constructs might explain the variations. Thus, we predict that the use of global versus specific measurement of place attachment and pro-

environmental behaviour would affect the impact of place attachment on pro-environmental behaviour.

To conclude our literature review, we posit that there is a need to assess how the link between place attachment and pro-environment behaviour differs across cultures (collective vs. individual), types of place users (tourists vs. local residents) and choices of measurement scales (global vs. specific) of the focal constructs – place attachment and pro-environmental behaviour. We present our meta-analysis framework in Fig. 1. Although a thorough assessment is not yet possible due to the limited number of studies published, we nevertheless begin the process of examining these differences in the results of empirical studies that are currently available in the literature.

[INSERT FIGURE 1 HERE]

3. METHODOLOGY

3.1 Study selection

We employed a literature search in different scientific databases to identify studies that examine the link between place attachment and pro-environmental behaviour. We systematically searched relevant studies in EBSCOhost, google scholar, Web of Science using keywords: place attachment, sense of place, place identity, pro-environmental behaviour, environmentally responsible behaviour. We also searched relevant papers in key journals such as *Tourism Management*, *Journal of Business Research*, *Journal of Environmental Psychology*, and *Journal of Travel Research*, and used the Pro-quest database for searching unpublished dissertations and theses. We considered our search for papers complete when various databases provided no more new papers on the topic.

Studies are included in our meta-analysis if they satisfy the following criteria: (1) these studies had to report the correlation coefficient (r) or the standardised regression coefficient

between any measures of place attachment and any measures of pro-environmental behaviour, (2) the articles were written in English, and (3) except for dissertations and theses, these articles had to be published in peer-reviewed international journals.

3.2 Meta-analysis procedure

Our meta-analysis followed standard meta-analysis procedures for correlation coefficient (i.e., Pearson's r) as a measure of effect size. However, some studies did not report correlation coefficients but provided standardised regression coefficients. We converted these standardised regression coefficients into correlation coefficients using the approximation formula suggested by Peterson and Brown (2005), which was $r = 0.98\beta + 0.05\lambda$, where λ equals 1 when β was non-negative and 0 when β was negative. One study (Gosling & Williams, 2010) reported two effect sizes in the form of Spearman's rank correlations (ρ), which we converted to Pearson correlations (r) using the conversion table provided in Gilpin (1993). We used the R metafor package (Viechtbauer, 2010) to perform standard calculations in meta-analyses, which included the computation of the summary of effect sizes and its confidence interval, the estimation of "fail-safe N" for publication bias analysis, statistical test for the homogeneity of effect sizes, and moderator analysis using mixed effects meta-analytic regression.

First, using the *escalc()* function in the R metafor package, we applied Fisher's Z transformations, which was the effect size used in the subsequent analysis. The transformation from r effect size to Fisher's Z was needed to normalise the distribution. For interpretation purposes, the estimates computed using Fisher's Z transformation were transformed back into correlation coefficients. The *escalc()* function in the R metafor package also calculated the sampling variance – subject-level variance and between-study variance of the effect sizes – which was needed to compute the weighted mean of the effect sizes and carry out the moderator analysis.

Second, we calculated correlation effect sizes and sample variances adjusted for measurement error following the procedure suggested by Hunter and Schmidt (2004). Correcting for measurement error is important because the error can attenuate the correlation between place attachment (PA) and pro-environmental behaviour (PEB) and the sample variances as a result of the imperfect measurement of both constructs. For the calculation of the correlation coefficients adjusted for attenuation and the sample variances adjusted for attenuation, we used Cronbach's coefficient alpha or composite reliability reported by studies as an estimator of measurement variability; otherwise, the measurement variability was set to one if neither composite reliability nor Cronbach's coefficient alpha was available. Third, using the transformed correlations (Fisher's Z), we estimated the weighted mean of the effect sizes by fitting a random-effects model and performed publication bias analysis.

Next, we performed the statistical test for homogeneity among the effect sizes—also called the heterogeneity analysis. We used the restricted maximum-likelihood estimation when estimating the amount of heterogeneity in effect sizes. The homogeneity analysis informs us whether the effect sizes from different studies are sufficiently similar to combine them into one overall effect size. The null hypothesis tested in the homogeneity analysis is that the underlying population effects are similar. If the null hypothesis is rejected, then in the next step, moderator analysis is conducted to examine whether moderator variables are related to variation in the effect sizes across studies. This second step was carried using the *rma.mv()* function in the R metafor package.

Fourth, we conducted a multilevel meta-regression analysis to assess the influence of moderator variables on the variation in the effect sizes. In this step, we used again the *rma.mv()* function in the R metafor package by fitting a three-level multilevel meta-regression model (Viechtbauer, 2010). A multilevel meta-analysis model is recommended for use when effect

sizes are not stochastically independent. Stochastic dependency among effect sizes can arise when studies produce multiple effect sizes that might be affected by common factors (e.g., characteristics of studies' respondents, the measurements of the independent and dependent variables, and the sampling methods used (Van den Noortgate et al., 2013). For example, one study can report multiple correlations between PA and each dimension of PEB where measures of correlations are collected from the same respondents. The resulting correlation effect sizes can correlate because different measurements are applied to the same respondents (Olkin & Gleser, 2009).

In modelling the stochastic dependency among the effect sizes, the multilevel model meta-analysis applied a three-level structure, which considers three different sources of variance in calculating effect size heterogeneity that occurs at three various levels of a meta-analytic model. That is, at level 1, the model considers the sampling variance of the effect size (i.e., sampling variance). At level 2, the model considers the variance between effect sizes of the same study (i.e., within-study variance) and at level 3, the variance of effect sizes due to study difference (i.e., between-study variance). Thus, this model allows effect sizes to vary between respondents (level 1), measures (level 2) and studies (level 3). To allow the metafor package to execute the three-level meta-analysis model, the `rma.mv()` function requires users to assign unique identifiers for each individual effect size as well as each study.

Using the `rma.mv()` function, we specified our moderator variables, which included culture (collectivist vs. individualist), place users (tourists vs. local residents), ways of measuring place attachment (general vs. specific), and ways of measuring pro-environmental behaviour (general vs. place-specific). Specifically, we categorised collectivist versus individualist cultures based on Hofstede's country scores (Hofstede, 1980). Note that all the country scores can be accessed on www.hofstede-insights.com. Because one of the objectives

of this study is to examine the effect of the national culture at the individual levels of tourist or resident, we avoid the inclusion of studies that use international tourists (i.e., individuals who visited a place in a foreign country). The majority of studies reported the nationality of their participants. For studies that did not report the nationality of their participants but only indicated their residency, we assumed that the participants possessed the national culture of the country of their residency whereas for residents we assumed that they were locals. One paper failed to report either the nationality of its participants or their residency, so this paper was dropped from subsequent analysis. We noted that a few studies reported mixed types of tourists (i.e., domestic and small percentage of international tourists). Unfortunately, there was no indication in the paper that these international tourists had a similar or different national culture than the domestic tourists. Fortunately, these studies did mention the percentage of the overseas tourists, which was very low. For example, the highest percentage of overseas tourists was 3% in Tonge et al. (2015) and Ramkissoon et al. (2013a). It could be that these small numbers of overseas tourists were outliers. To investigate the effect of these outliers, we created a new variable and coded studies according to whether they reported the combination of types of tourists' cultures (1=heterogeneous, 0=homogeneous) and ran our meta-analysis. Our results showed no difference in effect sizes between these two categories and thus, we dropped this variable in the subsequent analysis.

For the place attachment measure, we categorised the operationalisation of place attachment as general for studies that used one global or general construct (e.g., Buta et al., 2014) and specific for studies that used any dimension of place attachment (e.g., Cheng et al., 2013). Note that one study can use several dimensions of place attachment and examine the effect of each dimension on pro-environmental behaviour. We coded these effects separately. Since these multiple effect sizes from one study may create dependency among the effect sizes,

we dealt with this dependency by applying the multi-level model of meta-analysis explained at the beginning of this section.

For pro-environmental behaviour measures, we categorised them into two categories, namely place-general vs. place-specific. The place-general category referred to the measurement of pro-environmental behaviour that was not targeted at a specific place and could potentially be employed in any type of place (such as “talking to others about environmental issues” and “I have joined or contributed financially to environmental organisations”). Place-specific behaviour referred to the measurement of the pro-environmental behaviour that was specifically targeted at a given place (e.g., “sign petitions in support of the conservation on Ningaloo Reef”) or evokes place-associated thought (e.g., “I undertake environmental actions that contribute positively to the image of my city”).

4. RESULTS AND DISCUSSION

4.1 Data screening and descriptive results

We obtained 130 effect sizes from 38 research articles (see Table 2), published between 2002 and 2019. The majority of studies were published in tourism and environmental psychology journals. Before proceeding with meta-analysis, we checked for extreme effect sizes to detect the presence of outliers in the data using the boxplot. As we are especially interested in the moderator of culture (collectivist vs. individualist), we computed separate boxplots for the two types of culture. In total, we identified six outliers in both conditions for which the effect sizes exceeded the low and the upper whisker, defined as the 75% quantile minus/plus 1.5 times the box length.

Using the remaining effect sizes minus the outliers ($N=124$), we calculated the fail-safe N of Rosenthal (1979), which is the number of ‘missing’ studies that are non-significant and unpublished needed to nullify the meta-analysis result. The fail-safe N seemed very unlikely

to exist (Rosenthal's fail-safe $N=142089$). That is, there should be at least 142089 non-significant correlations between place attachment and pro-environmental behaviour intention to invalidate the result. Thus, there was no threat of publication bias in this meta-analysis study. We also created a funnel plot (see Figure 2), which showed that the studies were distributed symmetrically about the mean effect size. This indicated again that there was no potential threat of publication bias.

4.2 Main effect analysis

The weighted mean of the overall effect sizes was $r = 0.270$ (Fisher's $Z = 8.17$), which was statistically significant based on the 95% confidence interval (CI: 0.207 to 0.330) (see Table 3). This result showed that the effect of PA on PEB varied from moderate to large, and in general the effect was positive.

[INSERT TABLE 3 HERE]

4.3 Bivariate and moderator analysis

First, a statistical test for heterogeneity of the effect sizes showed that there was heterogeneity in the effect sizes ($Q(df = 123) = 2682.956$, $p < 0.001$). This meant that there were substantial variations in the effect sizes that might be systematic (e.g., due to differences in study characteristics or moderators). The presence of the heterogeneity in the effect sizes allowed us to conduct a meta-regression analysis to search for contextual factors that could explain the heterogeneity. In addition to presenting the result of the summary of the overall effect sizes, Table 3 also presents bivariate analysis results—the summary of effect sizes within each moderating dummy variable using a random effects model assumption (Borenstein et al., 2011). In the first row of Table 3, we show that the overall effect quantifying the relationship between PA and PEB was significant ($Z = 8.17$, 95% CI: 0.207 - 0.330) with a moderate size ($r = 0.270$).

As can be seen in Table 3, the bivariate analysis suggested that the effect of PA on PEB was (1) stronger in the collectivist ($r = 0.323$) vs. individualist culture ($r = 0.178$), (2) stronger for tourist ($r = 0.279$) vs. local residents ($r = 0.197$), (3) greater when PA was used as a general measure ($r = 0.286$) vs. a specific measure ($r = 0.199$) and appeared to be larger when PEB was place-specific ($r = 0.241$) vs. general ($r=0.174$). In addition to results of bivariate analysis, the meta-regression results confirmed these findings (see Table 4).

First, variable Culture had a significant negative coefficient ($b = - 0.190$, $p = 0.009$), showing that the effect of place attachment on behaviour was larger in the collectivist countries vs. individualist countries. Second, variable PA measure had a positive significant coefficient ($b = 0.165$, $p = 0.027$) suggesting that general measures of PA produced a larger effect size than that of specific measures. Third, variable Place users had a significant impact on the relationship between place attachment and behaviour ($b = 0.147$, $p = 0.002$), suggesting that type of place users indeed affected the link between PA and PEB. The results revealed that the effect of PA on PEB was larger for tourists vs. local residents. Fourth, variable PEB measure had a significant negative coefficient ($b = - 0.196$, $p = 0.023$), suggesting that specific measures of PEB produced a larger effect sizes than that of general measures. These results confirmed our predictions.

[INSERT TABLE 4 HERE]

5. CONCLUSIONS AND IMPLICATIONS

5.1 Key findings

The relationship between place attachment and pro-environmental behaviour has attracted research attention over the last two decades in response to the severe environmental challenges globally. However, the variances across individual studies have resulted in

inconsistent findings on the effectiveness of place attachment. Thus, to provide informative conclusions which are hard to obtain from individual studies, we conduct a meta-analysis on the relationship between place attachment and pro-environment behaviour. Aggregating previous research findings, our results indicate the presence of a positive effect of place attachment on pro-environmental behaviour, with the effect size ranging from small to large, and the overall effect is moderate ($r = 0.270$). Furthermore, we find that variations in the effect sizes can be explained by the study context. First, the effect of place attachment on pro-environment behaviour is stronger for tourists in a tourist site than for residents in their place of residence. Second, our results show that the effect of place attachment is stronger in collectivist countries (e.g., China) than in individualist countries (e.g., US). Third, the operationalisation of place attachment measurement affects the link between place attachment and pro-environmental behaviour. Finally, the operationalisation of pro-environmental behaviour affects the attachment-behaviour link where the effect of place attachment is stronger for place-specific (versus non-place specific) pro-environmental behaviour. These findings from our meta-analysis study enable us to gain a better understanding of contextual factors that shape the nature of the relationship between place attachment and pro-environmental behaviour.

5.2 Theoretical implications

Our meta-analysis contributes to the literature of place attachment and pro-environmental behaviour in the following three ways. First, it provides a better understanding about the magnitude and direction of the effect of place attachment on pro-environmental behaviour. As discussed in the previous sections, past studies have provided inconsistent results in regard to the effect of place attachment on pro-environmental behaviour, and thus there is no consensus on the strength and direction of the attachment-behaviour link (see Lewicka,

2011; Carrus et al., 2014). Synthesising 130 effect sizes from 38 studies, this current study offers a systematic research review of the effect and quantifies the strength of the effectiveness of place attachment in promoting pro-environmental behaviour. It shows that, although attachment feelings towards a place may imply satisfaction with existing environment conditions and a possibility of overlooking environmental problems, a protective motive provoked by place attachment would in general outweigh the oversight, leading to a behavioural tendency to improve the place.

Second, our study reveals that the relationship between place attachment and pro-environmental behaviour is stronger in collective cultures than in individualist cultures. As some researchers have proposed, what predicts pro-environmental behaviour in some cultural contexts may not work as effectively in other cultures (Tam & Chan, 2017). Pro-environmental behaviour is very likely shaped by the interaction of individual drivers (e.g., place attachment) and contextual drivers (e.g., culture) (Milfont & Markowitz, 2016). Our finding thus provides evidence that cultural contexts shall be considered in discussing the effect of place attachment on behaviours, and researchers should be cautious when generalising their research findings to different cultural contexts. This research result deserves explicit attention given the fact that the majority of extant research on the attachment-behaviour link has been conducted in individualist cultures, and relatively few studies have examined this link in collective cultures. Thus, further research should be encouraged in collective cultures, where the environmental strategies making use of place attachment may be more effective.

Third, our results demonstrate that the effect of place attachment on pro-environmental behaviour is stronger among tourists than local residents. This result is quite surprising and seems to be counter-intuitive as previous findings in literature show that tourists tend to be less environmentally friendly than residents (e.g., Becken, 2007; Miao & Wei, 2013). Our meta-

analysis results suggest that if tourists and residents are equally attached to a place, tourists will be more likely to behave pro-environmentally than residents. Despite the counter-intuitive findings, we speculate that tourists and residents develop their sense of attachment to a place in different ways, and thus behave pro-environmentally with different underlying motives. The attachment feelings of tourists towards tourist destinations are very often related to how the destinations can serve their recreational purposes. Thus, their pro-environmental behaviour that improves the destinations would facilitate their desired recreational experiences and account for the dimension of place attachment that is important to them. In addition, place-attached tourists might develop an anticipated nostalgic feeling about the place they have visited, which in turn influences their pro-environmental behaviours in that place—it is good to preserve a memory about a clean place rather than a dirty one. Hence, although previous literature shows that tourists may not be as environmentally friendly as residents (partially) due to their indulgent motives during vacations (e.g., Dolnicar & Grün, 2009), our findings imply that the motivations of tourists in choosing pro-environmental behaviour are more complex than currently suggested in the literature. In terms of residents, on the other hand, we speculate that when one lives in a place, what matters for a resident is probably the social bond that evolves during one's daily life in the residential area instead of the environment (Scannell & Gifford, 2014). We also speculate that there is a possibility that residents' mental energy with respect to maintaining and improving the quality of the environment of their residential area would not be stable as sticking to the same activities over time requires mental effort (Sjåstad & Baumeister, 2018). Furthermore, our results highlight the importance of place user segmentation in understanding the link between place attachment and pro-environmental behaviour. Since types of place users (e.g., residents versus tourists) may get attached to a place for different reasons and interpret the same place with different meanings, their attachment

feelings may serve different functions and manifest through differential behavioural tendencies towards the place (Scannell & Gifford, 2010a).

Fourth, our research shows that different operationalisation of the two focal constructs moderates the effect of place attachment on pro-environmental behaviour. It calls for future research attention on the multi-dimensional nature of place attachment and the potentially different role each dimension may play in promoting pro-environmental behaviour. Although there has been a small but growing number of studies comparing the impact of specific dimensions of place attachment on pro-environmental behaviour (e.g., Ramkissoon et al., 2013a; Song & Soopramanien, 2019), more research with a multiple measurement of place attachment is needed to expand our understanding of the effect of place attachment on pro-environmental behaviour. In addition, although attachment feelings to a place can generate a behavioural tendency to protect both the target place and the environment in general, our meta-analysis shows that the effect of place attachment is stronger on the behaviour towards the specific place that the individuals are attached to. This is consistent with the findings of previous empirical studies (e.g., Halpenny, 2007). This result suggests that future research should mention a targeted place in the measurement items so as to uncover the effect of place attachment on pro-environmental behaviour; if general measures are used, the effect could be small or not detected.

Given the above discussion on theoretical contributions, our analysis not only summarises the overall effectiveness of place attachment on pro-environmental behaviour, but also uncovers important contextual determinants of the attachment-behaviour relationship, which raise doubts concerning the general proposition that place attachment is an equally important predictor of pro-environmental behaviour under all circumstances.

5.3 Policy implications

Knowledge about the relationship between place attachment and pro-environmental behaviour, as well as how various contexts affect this link, would help the formation of effective policy initiatives in environmental management. Drawn from our meta-analysis procedure, the findings of the current study offer specific managerial implications. First, place attachment must be considered in environmental policymaking. The attachment feeling between people and place generates behavioural tendency to protect or improve the place. Thus, public authorities should make efforts to create, maintain and improve a sense of attachment to places among people. In addition, since individuals who are attached to a place may feel satisfied with the existing environment and overlook the need to protect or improve it, policy makers could design campaign messages that highlight the severity of environmental problems and communicate to the individuals that their beloved place still needs them to act in a more pro-environmental manner.

Second, public policy makers should consider the cultural context when designing environmental initiatives addressing place attachment and pro-environmental behaviour. Improving place attachment could generate higher environmental returns in collective cultures where group or community interests are more valued. Thus, authorities in collective cultures may bring forward these shared community values in marketing communications and integrate these cultural resources and the sense of place belonging with environmental management strategies. For example, in some cities and urban districts in China, the local authorities create a slogan in their pro-environmental campaign literally translated into English as “the district is our home, and its environment depends on every one of us”¹.

Third, place users deserve managerial attention. Our current findings indicate that tourists are more likely to behave pro-environmentally than the local residents. This finding

¹ <http://www.bjdch.gov.cn/n147/n183/c711357/content.html>

offers important implications for tourism management and underscores the importance of creating and strengthening tourists' sense of attachment towards the tourist destination in environmental management. For instance, given the tourists' behavioural tendency to protect their recreational environment, local authorities of tourist destinations could emphasise the essential roles of tourists in maintaining and improving the environment and invite those who are attached to act more responsibly. A powerful communication message for tourists may be the notion of creating a beautiful memory in their beloved destination. Such a message could be well integrated into a general pro-environmental punchline and may increase tourists' pro-environmental behaviours when visiting a destination.

Finally, our findings show that attachment feelings towards a place are most effective in promoting pro-environmental behaviours that target that place. Thus, to promote environmentally friendly behaviour, policy makers should relate the object of the attachment feelings to the target of the behaviour. For instance, attachment towards a local community could be used as a helpful policy tool to promote pro-environmental behaviour towards that community, whereas attachment to the global world would be effective in inviting contributions to global and transnational environmental projects.

In conclusion, our results serve to inform policy makers in environmental management on the extent to which place attachment is associated with pro-environmental behaviour, as well as the impact of the cultural and individual contexts. Understanding the distinctive effect of these contexts on the attachment-behaviour association will increase the effectiveness of future policy interventions. As such, policy makers should consider the factors that could amplify the effectiveness of place attachment and design environmental policies accordingly to make individuals more responsive to environmental problems.

6. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Our findings should be interpreted in the light of their limitations. First, the number of articles that we include in our meta-analysis study is relatively small as only these studies meet our inclusion criteria. In fact, not many articles on place attachment have linked place attachment to pro-environmental behaviour. Therefore, the generalisability of our results is limited by these restrictions. Second, our results show that the association between place attachment and pro-environmental behaviour is stronger among tourists than residents. Despite our attempt to justify this counter-intuitive finding, future research may look for potential control variables, which could influence the attachment-behaviour relationship that has been neglected in our study. Third, due to the limitations of the number of studies that are available, we have not differentiated effect size derived from place attachment as a global construct from one of its dimensions. Therefore, our results should be interpreted with caution. Future meta-analysis studies could examine the effect of each dimension of place attachment separately to gain a better understanding of the impact of place attachment on pro-environmental behaviour. Fourth, we are only able to document two study characteristics as potential moderators: operationalisations of place attachment and pro-environmental behaviour. Future studies may include other study characteristics. For instance, the pro-environmental behaviour can be distinguished into two different categories such as public sphere vs. private sphere environmental behaviour (Stern, 2000). While private-sphere environmental behaviour emphasises individuals' discretionary actions without involving others (e.g., recycling), public-sphere environmental behaviour emphasises individuals' discretionary actions that not only involve the individual but also others (e.g., persuasion behaviours) (Robertson & Barling, 2013). Finally, all studies included in our analysis have used self-reported psychometric measures as a method of assessing place attachment. Recently, a novel method of measuring place assessment has been introduced (Brown et al., 2015), which assesses people's spatial mapping of areas that they can identify with and/or depend on for their lifestyle and livelihood.

Pro-environmental behaviour research could increase policy relevance and help policy makers make better decisions if future research considers various methods of the assessment of place attachment.

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Appendices

Fig 1. Conceptual Framework

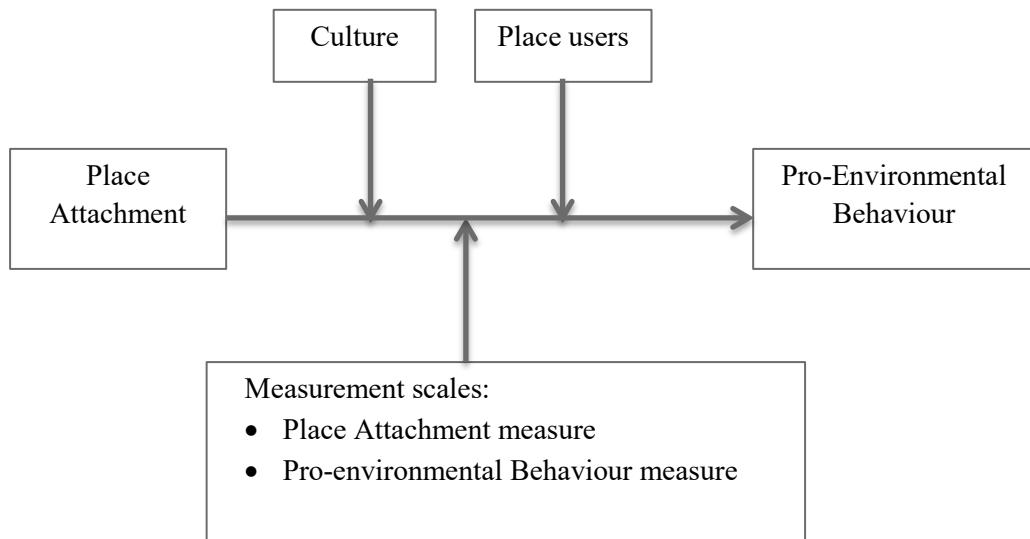


Fig. 2 Funnel Plot (N=124)

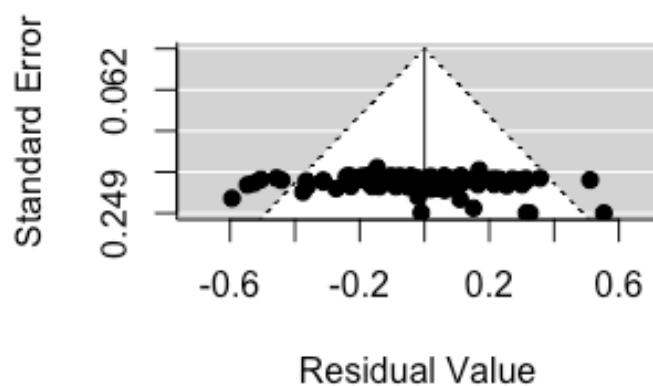


Table 1A. Examples of Previous Findings of PA-PEB relationship

Direction	Sample papers	Excerpts
Positive relationship	Ramkissoon et al. (2013a)	"The positive association between place social bonding and high effort pro-environmental behavioural intentions may be explained by the fact that some environmental behaviours are constructed through social interactions (Nye & Hargreaves, 2009)." (p.448)
	Walker et al. (2015)	"Controlling for RD, both local and global PA were positively related to pro- environmental behaviours." (p.843)
Negative relationship	Uzzell et al. (2002)	"What is surprising, though, is that the relationship between place-related social identity and social cohesion is not just weak but negative" (p.12).
	Junot et al. (2018)	"The results indicated that place identity is negatively related to general pro-environmental behaviors" (p.53).
No significant relationship	Tonge et al. (2015)	"...place dependence, the non-significant relationship between this place dimension and pro- environment behaviors may be explained by individuals who are more place dependent than place identity oriented, tending to overlook negative conditions or behaviors encountered at a place." (p.740)
	Ramkissoon et al. (2013a)	"Thus, the finding that place identity is not significantly related to pro-environmental behavioural intentions is not surprising." (p.448).

Note: PA = Place Attachment; PEB = Pro-Environmental Behaviour.

Table 1B. Examples of Papers on PA-PEB Relationship across Different Cultural Contexts

Cultures	Country	Sample papers	r ^a
Collective	China	Song et al. (2019)	0.632
	Iran	Valizadeh et al. ((2018))	0.460,
Individualist	Canada	Scannell and Gifford (2013)	0.280
	Italy	Meloni et al (2019)	0.103*, 0.112, 0.112, 0.086, -0.127, 0.113, 0.166

Note: PA = Place Attachment; PEB = Pro-Environmental Behaviour. * converted from regression coefficient; ^a Multiple effect sizes were reported of various magnitudes that come from different PA and PEB dimensions.

Table 1C. Examples of Papers on PA-PEB Relationship among Different Place Users

Place Users	Sample papers	Excerpts	r*
Residents	Larson et al. (2018)	“Place attachment increased the influence on PEB through its effect on other types of community involvement...When communities bond over a common attachment to place and passion for protecting it, civic action in all sectors (not just environmental) might be expected (Uzzell, Pol, and Badenas 2002; Manzo and Perkins 2006).” (p. 12)	0.194, 0.169, 0.188, 0.158.
	Song and Soopramanien (2019)	“... in cities like Beijing, the social connection and bonding amongst residents play a substantive role, which connects people and thus enhances their engagement in pro-environmental behaviors.” (p.118)	0.1, 0.149, 0.275, 0.189.
Visitors	Cheng and Wu (2015)	“... tourists with high attachment to the destination will prevent it from being damaged, and even convince others to adopt behavior benefiting the local environment.” (p.570)	0.5, 0.42, 0.44, 0.34
	Ramkissoon et al. (2013b)	“Findings suggest that place attachment has a strong and direct positive effect on both visitors’ low ... and high pro-environmental behavioural intentions.” (p.559)	0.531, 0.361

Note: PA = Place Attachment; PEB = Pro-Environmental Behaviour. * Multiple effect sizes were reported of various magnitudes that come from different PA and PEB dimensions.

Table 1D. Examples of Operationalisation of PA in prior PA-PEB studies

Operationalisation	Sample papers	Explanations	Illustration
Global construct	Ramkissoon et al. (2013b)	Authors conceptualized PA as a second-order construct and provided correlation of its composite score with PEB.	
	Walker et al. (2015); Hernandez et al. (2010)	Authors used a global unidimensional measure of PA.	
	Cheung and Hui (2018); Halpenny (2007)	Authors used multiple dimensions of PA, calculated the composite score, and provided the correlation between the composite score and PEB.	
Specific construct	Meloni et al. (2019); Stedman (2002); Buta et al. (2014)	Authors used one of the dimensions of PA (e.g., place identity) in their model, provided the respective correlation, and connected the dimension to PEB in their path model.	
	Ramkissoon et al. (2013a)	Authors used multiple dimensions of PA, provided correlation of each dimension with PA, and connected each dimension separately to PEB in their path model.	

Note: PA = Place Attachment; PEB = Pro-Environmental Behaviour. Dashed lines are used to indicate that the authors used a composite score by taking the average scores of the subdimensions of PA, thus the illustration does not represent a formative indicators measurement model.

Table 1E. Examples of Operationalisation of PEB in prior PA-PEB studies

Operationalisation	Sample papers	Sample items
General (i.e., non-place specific behaviour)		
Juneman and Rufaedah (2013)	-In the last 12 months, I avoid buying products from a company that I know may be harming the environment. -In the last 12 months, I signed and/or circulated a petition (offline/online) in support of protecting the environment.	
Lee (2011)	-I persuade others to adopt pro-environmental behaviors -I promote environmental conservation.	
Place-specific behaviour		
Cheng et al. (2013)	-I will try to learn how to solve environmental problems on the Penghu islands. -I will read the reports or books about the environment of the Penghu islands.	
Song et al. (2019)	-I undertake environmental actions that contribute positively to the image of my city. -I volunteer for projects, endeavours or events that address environmental issues in my city.	

Note: PA = Place Attachment; PEB = Pro-Environmental Behaviour

Table 2. Studies Collected and Number of Effect Sizes (n)

No	Author (Year)	Journal*	N
1	Buta, Holland, and Kaplanidou (2014)	JORT	1
2	Cheng, C. Wu, and Huang (2013)	JST	4
3	Cheng and Wu (2015)	JST	4
4	Cheng, Wang, Cao, Zhang, and Bai (2018)	AEER	4
5	Cheung and Hui (2018)	UFUG	1
6	Davis (2014)	Unpub	1
7	Gosling and Williams (2010)	JEP	2
8	Halpenny (2007)	Conf	2
9	Hernández, Martín, Ruiz, and del Carmen Hidalgo (2010)	JEP	2
10	Hsueh (2018)	IJOI	1
11	Juneman and Rufaedah (2013)	PSBS	5
12	Junot, Paquet, and Fenouillet (2018)	JTSP	2
13	Larson, Cooper, Stedman, Decker, and Gagnon (2018)	SNR	4
14	Lee (2011)	JST	1
15	López-Mosquera and Sánchez (2013)	JEP	4
16	Meloni, Fornara, and Carrus (2019)	Cities	7
17	Payton, Fulton, and Anderson (2005)	SNR	2
18	Pradhananga and Davenport (2017)	LUP	2
19	Quartuch (2014)	Unpub	9
20	Ramkissoon, Mavondo and Uysal (2018)	JST	2
21	Ramkissoon, Smith, and Weiler (2013a)	JST	8
22	Ramkissoon, Smith, and Weiler (2013b)	TM	2
23	Ramkissoon and Mavondo (2015)	JBR	4
24	Raymond, Brown, and Robinson (2011)	JEP	6
25	Scannell and Gifford (2010)	JEP	4
26	Scannell and Gifford (2013)	EB	1
27	Schroeder (2009)	Unpub	4
28	Song and Soopramanien (2019)	Cities	4
29	Song, Daryanto, and Soopramanien (2019)	JBR	1
30	Stedman (2002)	EB	1
31	Sullivan and Young (2018)	EB	6
32	Takahashi and Selfa (2015)	EB	1
33	Tonge, Ryan, Moore, and Beckley (2015)	JTR	9
34	Uzzell, Pol, and Badenas (2002)	EB	2
35	Valizadeh, Bijani, and Abbasi (2018)	JAST	1
36	Vaske and Kobrin (2001)	JEE	1
37	Walker, Leviston, Price, and Devine-Wright (2015)	EJSP	15
38	Zhang, Zhang, Zhang, and Cheng (2014)	JEP	1

Note: * JORT = Journal of Outdoor Recreation and Tourism, JST = Journal of Sustainable Tourism, AEER = Applied Ecology and Environmental Research, UFUG = Urban Forestry & Urban Greening, Unpub = Unpublished PhD thesis, JEP = Journal of Experimental Psychology, Conf = conference proceedings, IJOI = International Journal of Organizational Innovation, PSBS = Procedia of Social and Behavioral Science, JTSP = Journal of Theoretical Social Psychology, SNR = Society and Natural Resources, LUP = Landscape and Urban Planning, TM = Tourism Management, JBR = Journal of Business Research, EB = Environment and Behavior, JTR = Journal of Travel Research, JAST = Journal of Agricultural Science and Technology, JEE = Journal of Environmental Education, EJSP = European Journal of Social Psychology.

Table 3. Descriptive Meta-Analytical Results

	N	Effect	Z	LCL	UCL
PA→PEB	124	.270	8.17	.207	.330
Moderating effect of culture					
Collectivism	29	.323	6.06	.223	.417
Individualism	95	.178	6.80	.127	.228
Moderating effect of Place user					
Local residents	67	.197	4.96	.120	.272
Tourists	57	.279	6.77	.201	.353
Moderating effect of PA measurement					
Specific	79	.199	6.32	.138	.258
General	45	.286	5.48	.187	.380
Moderating effect PEB measurement					
Specific dimension	113	.241	8.02	.184	.297
General	11	.174	2.59	.043	.299

Note: N = number of studies; All effect sizes displayed are the r effect sizes transformed from Fisher's Z values and estimated using multilevel random effect meta-analysis model. Z- values and the lower (LCL) and upper limit (UCL) of the 95% confidence intervals are displayed. All Z-values are quite large, which are associated with p-value < 0.001.

Table 4. Results of Multilevel Meta-regression.

Variable	B	Se	P-value	Lower CI	Upper CI
Constant	0.291	0.063	0.000	0.168	0.414
Culture	-0.190	0.060	0.009**	-0.307	-0.073
Place user	0.147	0.056	0.002*	0.037	0.256
PA measure	0.165	0.054	0.027*	0.059	0.272
PEB measure	-0.196	0.086	0.023*	-0.365	-0.028

Note: Culture: individualism=1 and collectivism=0; Place user: 1=tourists, 0=residents; Place attachment (PA) measure: general=1, specific =0; Pro-environmental behaviour (PEB) measure: general=1, specific=0. * p<0.01, **p<0.05.