# The elusive impact of pro-environmental intention on holiday on pro-environmental behaviour at home

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## ABSTRACT

There is limited research studying how pro-environmental behavioural intentions gained in a tourism context subsequently influence intentions and actual behaviour at home. This study reports on a three-stage study that surveys Chinese domestic tourists on holiday, and at home one week and one month after the holiday experience. The findings suggest that the stated pro-environmental intention on holiday does not convert into actual pro-environmental behaviour at home. Neither pro-environmental intention nor pro-environmental behaviour are seen to change over time or location. It is the availability of infrastructure (physical context) that affects a change, as evidenced by Dinghu Mountain National Nature Reserve, which provides environmental information and significantly more facilities to enable pro-environmental behaviour than Chinese nationals find in their daily home environment. Implications are offered for ways to apply the ABC theory to policies that seek to achieve long-term environmental behavioural change, such as strong government policy interventions.

*Keywords:* context; pro-environmental intention; pro-environmental behaviour; longitudinal study; time-lagged SEM; sustainable tourism

## 1. Introduction

We know relatively little about the co-benefits, negative side effects, and spillover effects of Pro-Environmental Behaviour (PEB) (Hertwich, 2005). In recent years, there has been an increased interest in how one specific PEB will affect the possibility of adopting other PEBs that are similar, how it will translate to PEBs in other contexts, or over time (Nilsson, Bergquist, & Schultz, 2017). Prior research on PEB of tourists

has predominantly focused on the on-site context (Han, 2015; Goh, Ritchie, & Wang, 2017). Past empirical evidence supports that behaviour is context specific; although tourism contexts increase PEB intentions, it is rare that holiday-induced PEB intentions transform into actual long-term PEB (Ballantyne & Packer, 2011; Hughes, 2013; Wu, Huang, Liu & Law, 2015). For example, Ballantyne, Packer, and Falk (2011) reported, in their study on wildlife tourism sites, that although many of the tourists expressed a strong conservation intention, only a few of them took real actions after the visit. Further, a study of visitors to Mon Repos Conservation Park (Australia) found a similar weak association between on-site PEB intentions and off-site, actual PEB (Hughes, 2013). The results of the follow-up surveys revealed that the tourists' on-site enthusiasms and commitments to environmental conservation waned following their visit.

Studying behavioural, contextual and temporal PEB spillover is not common mainly because longitudinal research, the only viable means of measuring how intentions and behaviours in one context influence another, is rare. This owes to the difficulties in data collection and time required (Hughes, 2013). Most studies focus on the spillover between home and work (Littleford, Ryley & Firth, 2014; Verfuerth & Gregory-Smith, 2018). The few tourism studies that have tested such relationships provide mixed results (Hughes, 2013; Wu et al., 2015), arguably because they failed to evaluate the role of context in explaining behaviour (Jackson, 2005). According to the Attitude-Behaviour-Context (ABC) theory, context plays a critical role in determining individual behaviour, in addition to attitudinal factors, such as intention (Guagnano, Stern, & Dietz, 1995). Therefore, based on the ABC theory, this study investigates the impact of tourism experience on an individual's PEB at home. Specifically, we aim to understand whether, and under what conditions: 1) the tourism experience has an impact on PEBs that lasts over time; 2) the on-site PEB intentions of tourist convert into actual PEBs off-site; and 3) the role that context plays in affecting the transfer of PEBs from on-site to off-site.

The structure of this article is as follows. First, we develop the theoretical model and hypotheses drawing from the ABC theory and the Theory of Planned Behaviour (TPB). This is followed by an outline of the methodology that describes how data was collected and analysed for Chinese domestic tourists at the Dinghu Mountain National Nature Reserve and, subsequently, at home. Next, we summarise results to compare PEB intentions and self-reported behaviour over three time periods. The results and discussion show that, unlike in most Western studies, a lack of available infrastructure at home is the key contextual variable that limits the spillover effects of newly acquired PEB intentions at a nature reserve. The last section concludes with theoretical contributions and managerial implications arising from this study. The limitations of this study, and directions for future research, are also noted.

## 2. Theoretical background and hypotheses development

### 2.1 Pro-environmental behaviour in a home and tourism context

Pro-environmental behaviour (PEB) refers to purposeful actions that can minimise the negative impact of human behaviour on the environment (Kollmuss & Agyeman, 2002). As many environmental problems are rooted in human activities, it is imperative to encourage individuals to perform in an environmentally responsible manner (Miao & Wei, 2016; Liu, Wu & Che, 2019). There has been abundant research exploring the factors that underlie PEBs from different theoretical perspectives, e.g. using the Theory of Planned Behaviour (Greaves, Zibarras, & Stride, 2013; Wu et al., 2015), the Norm-Activation-Model (Liu et al., 2019; Onwezen, Antonides, & Bartels, 2013) and the Value-Belief-Norm Theory (Beall, Boley, Landon, & Woosnam, 2020; Denley et al., 2020; Han, 2015; Landon, Woosnam, & Boley, 2018). Three substantial dimensions are generally identified in the existing literature: internal factors (including motivational and habitual variables), external factors (including economic, social and cultural factors, and contextual factors), and personal characteristics relating to demographic variables (Kollmuss & Agyeman, 2002; Landon et al., 2018; Li, Zhao, Ma, Shao, & Zhang, 2019; Steg & Vlek, 2009). Among existing studies, the most investigated dimension is internal factors, particularly motivational variables.

Factors such as affective attitude (Greaves et al., 2013; Miao & Wei, 2013), moral concerns (Onwezen et al, 2013; Wu, Font, & Liu, 2020), environmental knowledge and awareness (Ballantyne et al., 2011), are documented as important antecedents that can help to shape PEBs. These studies are based on various contexts, including household (Miao & Wei, 2013; Untaru, Ispas, & Han, 2020), workplace (Greaves et al., 2013), hospitality (Han, 2015; Miao & Wei, 2013) and tourism settings (Ballantyne et al., 2011; Liu et al., 2019; Wu et al., 2015). However, research efforts studying the role of these different contexts in affecting PEBs are limited (Steg & Vlek, 2009; Whitmarsh et al, 2018; Wu et al., 2020; Xu et al, 2020).

Emerging studies have asserted that individuals' PEBs in a home context differ from how they perform in a hotel or tourism context (Holmes, Dodds, & Frochot, 2019; Miao & Wei, 2013; Untaru et al., 2020). Comparisons of PEBs and their determinants have been made between home and hotel settings (Miao & Wei, 2013; Untaru et al., 2020), and home and holiday settings (Holmes et al., 2019, Xu et al, 2020). Many of these studies have demonstrated that people tend to behave less environmentally in a holiday context than at home (Dolnicar & Grün, 2009; Holmes et al., 2019; Miao & Wei, 2013). For example, Dolnicar and Grün (2009) found that most residents engage in more PEBs when staying at home than when travelling. Miao and Wei's (2013) research, using data from the USA, suggested that the extent of an individuals' PEBs in a household setting is substantially higher than for the same individual in a hotel setting. Holmes et al. (2019) discussed the relationship between sustainable behaviours at home and during a holiday, highlighting the attitude-behaviour gap from PEBs in a home context compared to PEBs in a holiday context. However, these studies have not investigated, nor evidenced, how PEBs in a sustainable tourism context may shape people's PEBs once they return home, especially from a longitudinal perspective.

## 2.2 Attitude-Behaviour-Context (ABC) theory

The ABC theory was developed in the 1990s to highlight the role of context in affecting environmental behaviours (Guagnano, Stern, & Dietz, 1995; Stern, 1999).

This environmental psychology theory suggests that individual behaviour is highly situational and that attitude cannot effectively predict behaviour without the consideration of contextual factors (Stern, 1999, 2000). In the ABC theory model, "A" represents an individual's *attitude* toward a specific behaviour; "B" refers to the specific *behaviour*; and "C" is the context or contextual factor (Guagnano et al., 1995). Attitudes in the ABC theory refer to one's personal factors such as beliefs, values and intentions, which are at the centre of attempts to predict behaviour (Ajzen, 2005; Zhang, Li, Cao, & Huang, 2018). According to the ABC theory, the predictive effect of personal factors on PEB depends on contextual factors, such as the availability of infrastructure, costs and social norms (Stern, 2000). Contextual factors serve to impede or facilitate PEB and, together with personal/attitudinal factors, they explain PEB (Zhang et al., 2018). Individuals are more likely to engage in PEBs when *both* their attitude toward PEBs is positive and the context is supportive (Liu et al., 2019). Some researchers argue that the discrepant effects of attitudinal factors on behaviours found in prior studies can be attributed to the myopic examination of attitudes while overlooking contexts (Goh & Balaji, 2016; Stern, 1999, 2000). Only a few emerging studies have applied, or highlighted, the ABC theory in a tourism and hospitality context. Yadav et al. (2019) affirmed the importance of contextual considerations, with regard to psychological factors, in determining travellers' propensities to choose green hotels, while Kim et al. (2020) called for the use of the ABC theory in future research regarding tourist behaviour towards virtual reality (VR) tourism. The ABC theory has several advantages to serve as a theoretical foundation for this study. First, it was developed in the environmental psychology literature and is therefore adequately applicable to explain PEBs. Second, as it incorporates both personal and contextual factors into the investigation of PEBs, the ABC theory can help provide a more refined understanding of the formation of PEBs. Third, prior studies based on the ABC theory imply that the attitude-behaviour association varies in different contexts (Ertz, Karakas, & Sarigöllü, 2016; Zhang et al., 2018). If the influence on PEBs of contextual changes is of interest, the ABC theory may also help explain the attitude-behaviour gap that has been indicated in previous literature.

## 2.3 Hypotheses development

### 2.3.1 The attitude-behaviour gap

The 'Attitude-behaviour gap' refers to the disparity between stated attitude and actual behaviour on environmental issues (Kollmuss & Agyeman, 2002), which has been a major concern for both tourism practitioners and academics (Juvan & Dolnicar, 2014; Higham, Reis, & Cohen, 2016). Various tourism academics have studied the environmental attitude-behaviour gap or intention-behaviour gap, terms often used interchangeably (e.g. Hibbert, Dickinson, Gössling, & Curtin, 2013; Juvan & Dolnicar, 2014; Higham et al., 2016). Both the ABC theory and TPB have served as theoretical foundations in prior research to explain the attitude-behaviour gap regarding PEBs (Ertz et al., 2016; Wu et al., 2015).

TPB (Ajzen, 1985) is one of the most widely applied frameworks in PEB studies. TPB postulates that attitude, among other variables, directly influences behavioural intention, which in turn leads to the actual conduct of a particular behaviour. Prior research based on TPB has used intention as the indicator of behaviour, owing to its ease of measurement (Hughes, 2013). As a general rule, the stronger the intention to engage in a behaviour, the more likely someone will be to perform the behaviour. However, critics have emerged of environmental studies that merely measure intention, instead of behaviour (Hughes, 2013; Wu et al., 2015). These critics argue that there is a distinct gap between PEB intentions and behaviours; that PEB intention does not convert into real actions, as the tourists claim they do (Hughes, 2013; Juvan, & Dolnicar, 2014), in particular when the behavioural context changes (Wu et al., 2015; Whitmarsh et al, 2018).

Although there have been many concerns raised regarding the attitude-behaviour gap, limited research has investigated this gap longitudinally. An exception is Ballantyne and Packer (2011), who indicated that many people still showed a strong intention to conserve environment shortly after a tourism visit, yet merely 7% of the respondents actually converted the intentions stated while on holiday into actual PEBs

at home. This is consistent with mainstream PEB spillover literature, which has found few, modest cases of transfer of PEB, with some moral licensing cases even identifying negative cross-lagged effects (Thøgersen & Ölander, 2003). Combined, these studies suggest that stated PEB intentions at a tourism context are likely to be extended into the home context; however, the intentions might have limited impact on the transformation of PEBs (see Figure 1). Hence, we hypothesise that:

H1: Onsite PEB intention in a tourism context positively predicts PEB intention in a home context but cannot predict home PEB.

H2: The impact of PEB intention on PEB in a tourism context fades over time.

### 2.3.2 The impact of context on behaviour

Contextualising human behaviour research makes theoretical models more accurate and the interpretation of results more robust (Rousseau & Fried, 2001). Social psychology refers to context as "the surroundings associated with phenomena which help to illuminate that phenomena, typically factors associated with units of analysis above those expressly under investigation" (Cappelli, 1991). Context provides both opportunities and constraints for human behaviours, hence considering context is critical to developing a more complete understanding of person × situation interactions (Johns, 2001). In spite of an obvious increase in research awareness of how context plays a role in shaping the phenomena or relationships (Bamberger, 2008), relatively little is empirically known about how contextual factors actually influence individual behaviours. Even in cases where researchers take context into account, it is mostly considered as a control variable rather than a factor that can directly impact on the relationship being investigated.

Although the gap between tourists' PEB intentions and PEB in post-visit stage has been empirically tested (Ballantyne, Packer, & Falk, 2011; Hughes, 2013), the question of why PEB intentions do not lead to behavioural change has not been clearly answered. Some researchers have tried to identify the impact factors (e.g., post-visit action resource, ease of behaviour, sunk costs) that could facilitate the

translation process between intentions and behaviours over time and across contexts (Ballantyne & Packer, 2011; Bueddefeld & Van Winkle, 2017; Wu et al., 2013, Xu et al, 2020). However, there is a lack of discussion of the impact of context, which can help to further explain the gap between PEB intentions and subsequent actual behaviour. An examination of the tourism PEB research offers little evidence of the influence of contextual factors. Instead, the tourism literature mainly focuses on intra-personal factors such as attitudes, intentions or ease of behaviour (Ballantyne, Packer, & Sutherland, 2011; Brown, Ham, & Hughes, 2010; Wu et al., 2015, Xu et al, 2020), while contextual factors such as physical infrastructure have not been given as much attention as they deserve (Steg & Vlek, 2009; Whitmarsh et al, 2018).

Behavioural intention has been advocated as temporally unstable (Mazursky, 1990). People's PEB intentions and actual PEBs vary among difference contexts (Barr, Shaw, Coles & Prillwitz, 2010; Juvan, Ring, Leisch, & Dolnicar, 2016; Miao & Wei, 2013; Miller, Merrilees, & Coghlan, 2015). Although PEB has been found to be part of one's social identity, Hibbert et al. (2013) found that there are different selves for the same person that are context-specific. Even individuals with a strong sense of sustainability identity only engaged in sustainability activities on holiday that afforded them "indulgence" (Gössling, 2018), "hedonism" (Malone, McCabe, & Smith, 2014) or when it was convenient (Miller et al., 2015) or comfortable (Barr, Gilg & Shaw, 2011) to do so.

Furthermore, when travellers engaged in PEBs that felt like a sacrifice, such as purchasing carbon offsets, they subsequently increased the frequency of their environmentally harmful behaviours (Miller & Effron, 2010). As memories of the tourism experience tend to fade away over time, interventions such as post-visit action resources have been suggested in previous studies to maintain the impact of onsite PEB intentions (Ballantyne, Packer, & Sutherland, 2011; Wu et al., 2013). This implies that an individual's behaviour is geographically and temporal contextual (see Figure 1). As such, following on from H1 and H2, we posit:

H3: PEB is most significantly determined by the same-context PEB intention (geographical and temporal).

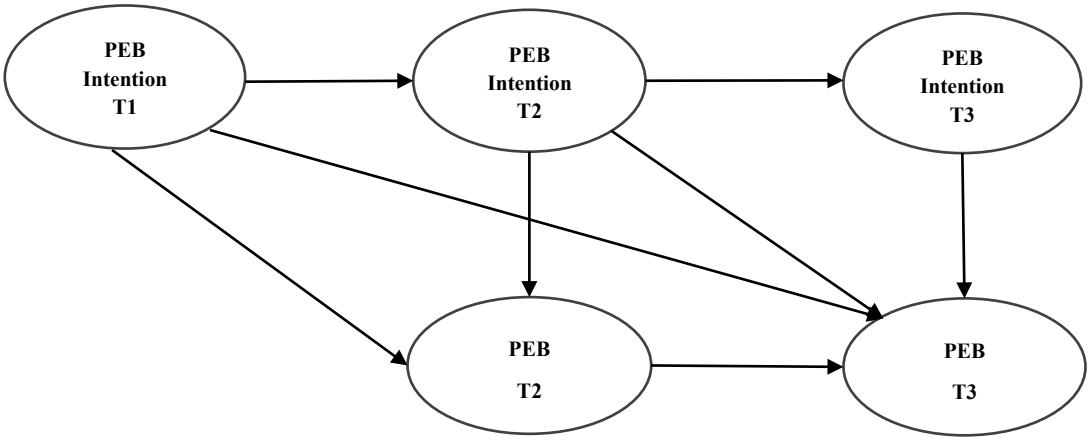



**Figure 1:** The time-lagged model of pro-environmental intentions and behaviours

*Note*: PEB=Pro-Environmental Behaviour

People may not always have sufficient control to translate their attitudinal factors (i.e. PEB intention) into actual behaviours (i.e. PEB). Contextual factors, such as resources and opportunities, determine the extent to which individuals convert their intentions into behaviours (Steg & Vlek, 2009; Whitmarsh et al, 2018). The influence of context is discussed in various studies that investigate individual behaviour; these studies show that physical environment is an important contextual dimension (Arbuthnott, 2009; Miller et al., 2015). An individual's PEB can only take place when the necessary conditions and facilities are in place. For example, the availability of infrastructure is a key contextual factor that impacts individuals' abilities to show PEBs both at home (Young & Middlemiss, 2012) and on holiday (Miller et al., 2015) to such an extent that a lack of infrastructure has been found to be a stronger barrier than internal factors in supressing PEBs (Budeanu, 2007; Wu et al., 2015). Prior tourism literature asserted that the availability of infrastructure at a destination enables tourists to continue with their home-based PEBs (Dolnicar & Grün, 2009; Juvan, Ring, Leisch, & Dolnicar, 2016; Miller et al., 2015). Adversely, a lack of infrastructure at a tourism context explains why PEB weakens when residents become tourists. However, these are mainly studies that assume that Western tourists will have fewer environmental facilities available during their holiday than in their home

context. Little research has provided evidence of how residents in developing countries may actually encounter superior, pro-environmental infrastructure while travelling compared to their home context. If people behave less responsibly towards the environment while on holiday when there is a lack of infrastructure, we can infer that the availability of appropriate facilities remains important to convert onsite PEB intentions into actual behaviours at home. The difference in the availability of infrastructure may provide an explanation for the PEB attitude-behaviour gap. As such, we propose the following hypothesis:

H4: The PEB of an individual in their home context is significantly determined by the perceived availability of infrastructure.

## 3. Methodology

### 3.1. Research design

Following a longitudinal research design, this study aims to determine the impact of tourism experiences on individuals' PEBs at home, and the role of context in shaping PEBs. This study was designed as a three-stage longitudinal study. To begin with, an onsite survey was conducted in a sustainable tourism setting. This was followed by two follow-up surveys, which were distributed one week and one month later. To assess Hypotheses 1, 2 & 3 (the relationships among PEB intentions in the tourism context, PEB intentions and PEBs once tourists return home), time-lagged structural equation modelling (SEM) was employed to examine relation paths across time as well as within-time. Prior social psychology literature contends that time-lagged SEM is the optimal approach to model effects and changes over time periods (Bosley, Sandel, & Fisher, 2020; Valiente et al., 2003). Time-lagged SEM has been employed and validated in some studies (Barnes, Mattsson, & Sørensen, 2016; Lee, Lockshin, Cohen, & Corsi, 2019), although not previously for tourism research. More use of longitudinal data, as well as time-lagged SEM, was called for by these pioneering efforts. Additionally, a series of paired-sample T-tests were conducted, to further depict the changes of PEB intentions, PEBs and contextual factors (e.g. physical infrastructure) from tourism to home contexts. In order to determine the role of context in shaping PEBs (Hypothesis 4), the effects of the availability of infrastructure on PEB intentions and PEBs were evaluated using multiple regression

analysis, which is widely considered to be a useful and efficient analytical technique to use when examining the effects of multiple independent variables on a dependent variable (Sinclair-Maragh & Gursoy, 2015).

### 3.2 Sample and procedure

Data was collected at the Dinghu Mountain National Nature Reserve in the Guangdong Province of Southern China. The reserve attracts approximately 600,000 tourists annually. It was the first National Reserve in China (designated in 1956) and has been included in UNESCO's International Man and Biosphere Reserve Network as a global conservation area. It presents a world-unique ecosystem of tropical and subtropical forest, and, thus, is of high environmental education and research value. Hosting abundant species of flora and fauna, the most striking feature of the reserve is its biodiversity. Environmental education and interpretation programmes are provided to increase the environmental knowledge of tourists; specifically, to raise awareness of wildlife and environmental conservation. Thus, Dinghu Mountain Reserve is deemed an appropriate study site for the current research.

An onsite survey (T1) was conducted over eight days (April 2-9, 2017; including both week days and weekends) by six, well-trained research assistants who distributed questionnaires at three tourist spots within the reserve. Every third tourist was approached and asked if they were willing to participate in the survey. A souvenir was offered as an incentive for completing the questionnaire. If the person refused to engage in the survey, the very next person was approached. A total of 285 valid questionnaires were obtained onsite (T1 = 285). Tourists who agreed to complete the questionnaire were further asked whether they would like to participate in the follow-up surveys. Among the 285 participants, 237 agreed to engage further. An email address, or a WeChat account address (WeChat is the most popular messaging App in China), was collected from the 237 participants who consented to participate in the follow-up surveys. A typical requirement of studies requiring follow-up research is that data collected can be confidential but not anonymous, in order to match multiple surveys of participants over time. However, in this study, every respondent was coded with a unique number, which allowed us to track participation over the three time periods while anonymising data.

The first follow-up survey (T2) occurred one week after the tourists returned home from the Dinghu Mountain reserve (April 10-16, 2017). A WeChat or email notification, with a link to the electronic version of the survey, was sent to each of the respondents that had agreed to participate further. A cash incentive (of approximately $0.72 USD, where 1USD=6.9RMB at the time of the survey) was offered, as prior research suggests that cash rewards not only improve the response rate but also the response speed for follow-up surveys (Brennan, 1992; Erwin & Wheelright, 2002). Of the 237 follow-up questionnaires sent, 188 valid responses were received (T2 = 188); a response rate of 79.32%.

The third survey (T3) was conducted one month after the tourists had visited the reserve (May 2-9, 2017). The survey was only sent to respondents who had completed the T2 survey. Another monetary incentive, of the same value, was offered. This time, 111 of the 188 respondents who had engaged in the T2 survey satisfactorily completed and returned the third questionnaire (T3=111). As such, of the initial 285 tourists, 38.9% completed all three surveys. The data analysis of this study is based on the 111 respondents only; this represents a good sample size for this type of study given the problematic nature of longitudinal data collection (Barnes et al., 2016).

### 3.3 Measurement

The onsite survey included questions designed to measure: i) PEB intention, and ii) the availability of infrastructure. The measures of PEB intention were adapted from Hughes, Packer and Ballantyne (2011) and Ramkissoon et al.'s (2013) research on tourist PEB. Such measurements of PEB intentions have been validated in previous research studying long-term behavioural changes of PEBs from tourism to non-tourism contexts (Hughes, 2013; Wu et al., 2015) as well as in studies exploring the formation of PEB intentions in a nature-based tourism context (Lee & Jan, 2015; Wu et al., 2020).

In addition to the three surveys, and following the procedure by Hughes (2013), we conducted a review of the Dinghu Reserve's environmental education and interpretation programmes, and sought the opinions of experts (including the Dinghu

343 Reserve's management staff and academic professionals) to ensure that our
344 measurements of PEBs/PEB intentions featured the PEBs highlighted within the
345 Dinghu Reserve's interpretive programmes. For example, in the Dinghu Reserve,
346 there are interpretive signs such as "*Water is life. Conserving water resource is to save*
347 *life*"; hence, the behavioural intention of conserving resources and energy was
348 retained as one of the measurement items.

349 To consider the research objective of investigating the spill-over effect from
350 tourism to home contexts, PEBs that could be adopted by all visitors, from a
351 long-term perspective, were included as follows: 'I intend to conserve resource and
352 energy'; 'I intend to recycle'; 'I intend to sort garbage'; 'I intend to use
353 'green'(non-plastic) shopping bags'; 'I am willing to remind others to avoid doing
354 environmentally harmful behaviours'; 'I am willing to look for environmental
355 information on TV, in print or on the internet'; 'I am willing to donate money to
356 support environmental conservation'; and 'I am willing to volunteer my time to
357 projects that help the environment'. Measurement of the availability of infrastructure
358 was modified from Miller et al. (2015), resulting in four statements: 'The current
359 context has sufficient recycling facilities'; 'The current context has sufficient public
360 transport'; 'There is sustainable infrastructure in the current context'; and 'The
361 current context enables green consumption'. Respondents were asked to rate their
362 agreement with the statements on a seven-point scale (from 1= strongly disagree to 7=
363 strongly agree).

364 Both follow-up surveys were identical. They first repeated the measurements of
365 PEB intention and availability of infrastructure measured on site. Then, in addition,
366 they measured actual PEBs that mirrored the eight statements used to measure PEB
367 intention, i.e., instead of asking the respondents about their intention to engage in
368 sustainable practices, they asked the respondents to report the frequency of their
369 actual PEB, using a seven-point scale (from 1=never to 7=always). The questionnaires
370 were originally developed in English and then translated into Chinese by a bilingual
371 Chinese–English researcher. The back translation into English was conducted by

another bilingual Chinese–English researcher. Five experts in sustainability academia assessed the content validity of the questionnaires by purifying the measurement items based on the Chinese context. The design and wording of the questions were also examined during the pre-test process to ensure the appropriateness of the survey.

All Cronbach's alpha values exceeded the 0.7 threshold (ranging from 0.790 to 0.917), suggesting good internal consistency reliability of the instrument (Nunnally, 1978). Reliability was also assessed by inter-rater reliability estimates using intra-class correlation coefficients (ICC). The results exceeded the 0.60 benchmark: ICC=0.841 for PEB Intention; ICC= 0.674 for Availability of Infrastructure; ICC=0.783 for PEB, indicating an acceptable level of inter-rater reliability.

### 3.4 Comparison of measurement

Pearson correlation analysis was conducted to see the relationships between the constructs (see Table 1). Table 1 also presents the mean and standard deviations of the constructs for T1, T2 and T3. A statistically significant change of Availability of Infrastructure from T1 to T2/T3 can be observed. A paired-sample T-test was then conducted to examine whether the constructs changed significantly from onsite to offsite.

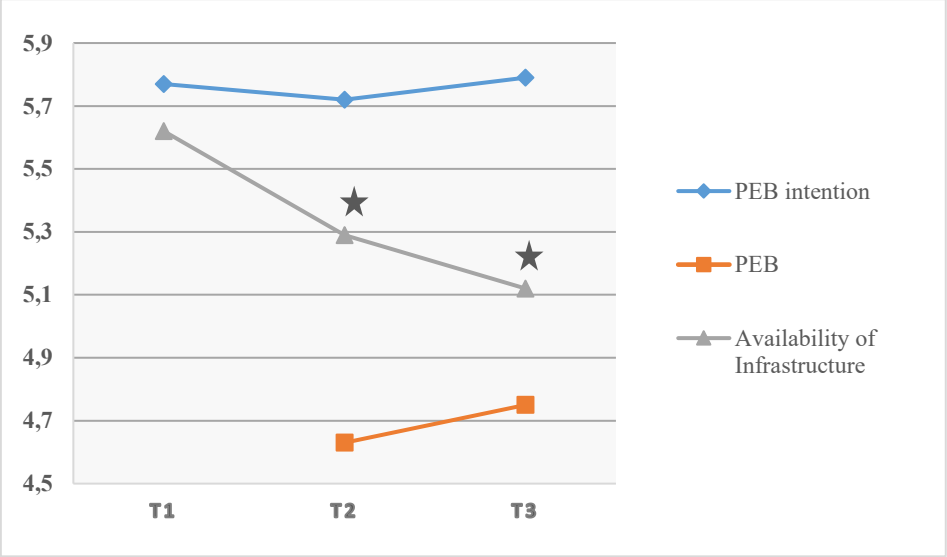
**Table 1. Descriptive statistics**

| Constructs | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.PEB intention(T1) | 5.77 | 0.79 | 1 | | | | | | | |
| 2.PEB intention(T2) | 5.72 | 0.91 | 0.72** | 1 | | | | | | |
| 3.PEB intention(T3) | 5.79 | 0.77 | 0.55** | 0.71** | 1 | | | | | |
| 4. PEB (T2) | 4.63 | 1.06 | 0.43** | 0.68** | 0.55** | 1 | | | | |
| 5. PEB (T3) | 4.75 | 1.06 | 0.40** | 0.59** | 0.65** | 0.64** | 1 | | | |
| 6.Availability of Infrastructure (T1) | 5.62 | 0.95 | 0.50** | 0.45** | 0.37** | 0.29** | 0.38** | 1 | | |
| 7. Availability of Infrastructure (T2) | 5.29 | 0.95 | 0.25** | 0.37** | 0.23* | 0.52** | 0.40** | 0.38** | 1 | |
| 8. Availability of Infrastructure (T3) | 5.12 | 1.11 | 0.22* | 0.27** | 0.25** | 0.34** | 0.35** | 0.32** | 0.60** | 1 |

*Note*: a) PEB=Pro-Environmental Behaviour; b) *p < 0.05, **p < 0.01, ***p < 0.001.

As seen in Figure 2, there was no significant change in the PEB intentions of tourists from T1 to T2 or T3, and no significant change of PEBs from T2 to T3.

393 However, the mean result of perceived availability of infrastructure onsite, at the
394 tourist destination (T1), was significantly higher than the perceived availability of
395 infrastructure offsite, at home (T2 and T3). This finding indicates that the respondents
396 perceived that there were more facilities for PEB at the Dinghu Mountain reserve than
397 exist in their daily home life context.




398
399 **Figure 2:** Changes in PEB intentions, PEBs and Availability of Infrastructure over the three
400 time periods
401 ★

402 Considering the potential attrition effect in a longitudinal study, we followed
403 Vandenberg and Self's (1993) procedure to examine whether the initial group (285
404 respondents) and the follow-up group (111 respondents) had significant differences.
405 Those who engaged in all three surveys were coded as 1 and those who only
406 responded at the initial stage (onsite survey) were coded as 2. The results of an
407 independent T-test showed that there were no significant differences between the
408 groups in terms of gender ($F$=4.464, $df$=220, $p$=0.639), education ($F$=0.009, $df$=283,
409 $p$=0.834) or income level ($F$=0.010, $df$=283, $p$=0.234). However, the mean age of the
410 non-follow-up group respondents was significantly higher than that of the follow-up
411 group respondents. This difference was not deemed significant as the mean ages of
412 both groups were within the range of 16-35, which reflects the cohort of tourists that

visit the Dinghu Mountain reserve (See Table 2). The results of comparing the measurements suggested that there was no serious attrition bias in this study.

**Table 2.** Descriptive Statistics of Respondent Profile

| **Initial Group (N=285)** | | | **Follow-up Group (N=111)** | | |
|---|---|---|---|---|---|
| **Gender** | **#** | **%** | **Gender** | **#** | **%** |
| Male | 117 | 41.1% | Male | 50 | 45% |
| Female | 168 | 58.9% | Female | 61 | 55% |
| **Age** | | | **Age** | | |
| 16-25 | 173 | 60.7% | 16-25 | 87 | 78.4% |
| 26-35 | 71 | 24.9% | 26-35 | 12 | 10.8% |
| 36-45 | 31 | 10.9% | 36-45 | 11 | 9.9% |
| 46-55 | 8 | 2.8% | 46-55 | 1 | 0.9% |
| 56 or above | 2 | 0.7% | 56 or above | | |
| **Income (USD/ month)** | | | **Income (USD/month)** | | |
| 145 | 19 | 6.7 % | 145 | 15 | 13.5% |
| 146-725 | 125 | 43.9% | 146-725 | 51 | 45.9% |
| 726-1449 | 91 | 31.9% | 726-1449 | 29 | 26.1% |
| 1450-2174 | 24 | 8.4% | 1450-2174 | 7 | 6.3 % |
| 2174 above | 26 | 9.1% | 2174 above | 9 | 8.1 % |
| **Education** | | | **Education** | | |
| Secondary school or below | 5 | 1.8% | Secondary school or below NO DATA | | HERE? |
| High school | 43 | 15.1% | High school | 13 | 11.7% |
| Undergraduate | 215 | 75.4% | Undergraduate | 89 | 80.2% |
| Postgraduate or above | 22 | 7.7% | Postgraduate or above | 9 | 8.1% |

## 4. Results and discussions

### 4.1. Analysis of attitude-behaviour (A-B)

The results of the structural equation model (SEM) reveal a Chi-square of 1293.99 (df =692, p <0 .01, $\chi 2$ /df=1.87). As Chi-square is sensitive to sample size (Gerbing & Anderson, 1985), it has been suggested by psychometric literature that if the Chi-square, adjusted by its degrees of freedom, is not over 3.0 ($\chi 2$ / df≤3), it shows a reasonable model fit (Kline, 2004). The comparative fit index (CFI) is the goodness-of-fit index deemed to be the best approximation of the population value for a single model (Hu & Bentler, 1999). CFI values range from 0.0 to 1.0, where the higher the value, the better (ideally, greater than 0.90). The Root Mean Square Error

of Approximation (RMSEA) is a measure of the average standardized residual per degree of freedom; a value lower than 0.08 shows a good model fit and 0.08-0.1 a mediocre fit (Browne & Cudeck, 1992). Hu and Bentler (1999) argued that RMSEA may over-reject a true model when the model has a small sample size (N<250). Furthermore, Iacobucci (2010) asserted that social science researchers should not be overly concerned if a CFI value is not greater than 0.90 or the RMSEA is not quite lower than 0.08. As a result, the overall fit of the proposed model ($\chi 2$ /df=1.87, CFI=0.832, RMSEA=0.089) was deemed to be acceptable.

As shown in Table 3 and Figure 3, onsite PEB intention of tourists (at T1) positively and significantly affects offsite PEB intention (at T2), with a high path coefficient ($\beta$=0.829, p<0.001). The PEB intention at T2 also has significant positive effect on PEB intention at T3 ($\beta$=0.590, p<0.001). However, the results show that offsite PEBs (at T2 and T3) were not significantly determined by onsite PEB intention (T1). The findings suggest that although PEB intentions in a tourism context impact on PEB intentions within peoples' home contexts, such effects cannot be converted into actual actions at home. Such findings support Hypothesis 1, that onsite PEB intention in a tourism context positively predicts PEB intention in a home context but cannot predict home PEB. In addition, as the results reveal that the impact of PEB intention in a tourism context becomes limited in a home context, this finding supports Hypothesis 2, that the impact of PEB intention on PEB in a tourism context fades over time.

**Table 3:** Results of time-lagged structural equation modelling

| Paths | Path Coefficients | C.R. | Hypotheses |
|---|---|---|---|
| PEB intention T1→PEB intention T2 | 0.829*** | 7.290 | H1 supported |
| PEB intention T2→PEB intention T3 | 0.590*** | 4.258 | H1 supported |
| PEB intention T1→PEB T2 | -0.301 | -0.181 | H1, H2 supported |
| PEB intention T1→PEB T3 | -0.094 | -0.568 | H1, H2 supported |
| PEB intention T2→PEB T3 | 0.087 | 0.396 | H1 supported |
| PEB intention T2→PEB T2 | 0.981*** | 5.094 | H3 supported |
| PEB intention T3→PEB T3 | 0.451*** | 3.520 | H3 supported |

| | | | |
|---|---|---|---|
| PEB T2→PEB T3 | 0.345** | 2.600 | H3 supported |

***Notes:*** a) PEB=Pro-Environmental Behaviour; b) *p < 0.05, **p < 0.01, ***p < 0.001; c) C.R.=Critical Ratio

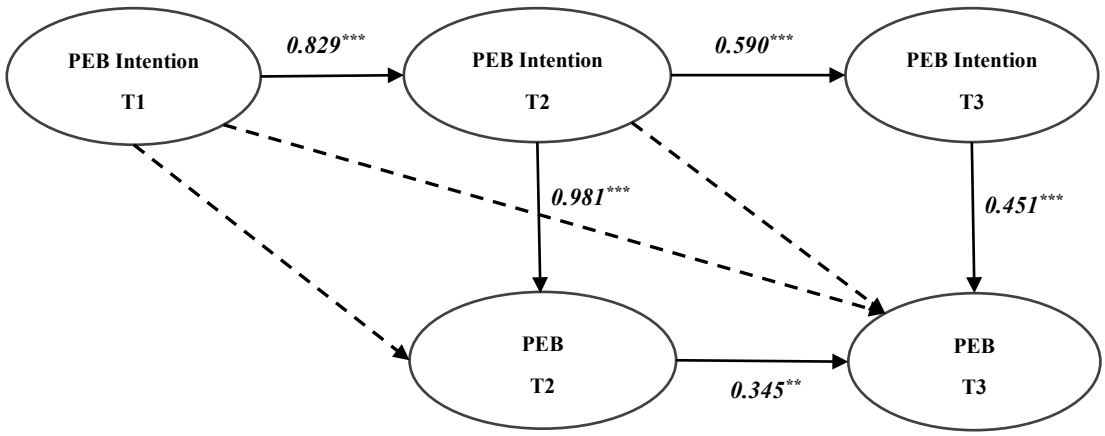



**Figure 3:** The results of the time-lagged model of pro-environmental intentions and behaviours

*Note*: a) PEB=Pro-Environmental Behaviour; b) *p < 0.05, **p < 0.01, ***p < 0.001; c) a dashed line represents no significant path and a solid line represents a significant path.

The results also show strong, positive, predictive relationships between PEB intention and actual PEB at the same context: PEB intention (T2) →PEB (T2), β=0.981, p<0.001; PEB intention (T3) →PEB (T3), β=0.451, p<0.001. Notably, although PEB intention (T2) and PEB (T3) were both based on offsite situation, the link of PEB intention (T2) →PEB (T3) was not significant. Such findings attest that individuals' PEBs are most significantly determined by their PEB intentions in the same context. This supports what is hypothesised in H3, that PEB is most significantly determined by the same-context PEB intention (geographical and temporal). Additionally, the path coefficient of intention-behaviour at T3 is much lower than for the same association at T2, suggesting a fall in positive impact of PEB intention on PEB over time. Such findings further support hypothesis 2 that the impact of PEB intention in a tourism context fades over time.

468 The above findings illustrate the *attitude-behaviour* gap between onsite PEB
469 intention and offsite PEB, and show this to be in line with the findings of previous
470 literature (Ballantyne et al., 2011; Hughes, 2013; Wu et al., 2015), i.e., that onsite
471 PEB intentions hardly convert into offsite PEBs. The impact of tourism-context PEB
472 intentions on home-context PEBs is limited. This finding questions the use of
473 behavioural intentions alone as an indicator of sustainable behavioural change, as seen
474 in previous literature. While PEB intentions do not change much from onsite to offsite,
475 and remain stable after one month, this study found that the impact of PEB intentions
476 on PEBs in the same context becomes less promising over time. Such finding
477 confirms the proposition by Hughes (2013) and Hibbert et al. (2013) that people tend
478 to overstate their involvement in sustainability actions, both in a tourism context and
479 elsewhere. The results raise questions as to *why the impact of tourism experience on*
480 *long-term PEB fades in the time after the visit finishes,* and *why the link of PEB*
481 *intentions-PEBs is weak*. To consider these questions, we draw from the ABC theory,
482 which explains the complex relationship between attitude, behaviour and context
483 (Guagnano et al., 1995), while noting that we should be aware of the impact caused
484 by a change of context.

485 4.2. Analysis of behaviour-context (B-C)

486 Although PEB intentions did not significantly change over the time periods, the
487 change of context may have played a role in affecting the transformation of PEB
488 intention into actual PEB. The context change in this study is manifested in two
489 aspects (Nilsson et al, 2017): i) geographical context change (from tourism context to
490 non-tourism context); and ii) institutional context change (from perceived
491 infrastructure available to perceived a lack of infrastructure). The results of
492 Time-lagged SEM (see Table 3 and Figure 3) affirm that actual PEB is most
493 significantly determined by the same-context intention rather than by the
494 tourism-context intention, which reveals that the geographical context change can add
495 an explanation of the attitude-behaviour gap indicated in prior research (Ballantyne et
496 al., 2011; Hughes, 2013; Kollmuss & Agyeman, 2002). As previously stated, the

results of the paired-sample T-test (see Figure 2) suggest that the respondents perceive that there is more available infrastructure supporting PEBs in this particular tourism context (T1) than exists in their home contexts (T2 and T3). The significant fall in the availability of infrastructure from the onsite context (T1) to the offsite contexts (T2 and T3), provides a further explanation of the attitude-behaviour gap and why the impact of tourism PEB experience fades away over time.

As Steg and Vlek (2009) indicated, the role of contextual factors in affecting PEB can be either direct or indirect. In the case of availability of infrastructure, a direct influence on PEB has been well-noted in previous studies (Fujii & Kitamura, 2003; Miller et al., 2015; Nilsson et al, 2017; Steg & Vlek, 2009), as one cannot perform many PEBs without the necessary facilities (e.g. recycling bins). To further illustrate the behaviour-context relationship, this study also examined the influential effect of availability of infrastructure on PEB intention and actual PEB. Table 4 presents the results of the regression analysis. The results show that, at both T2 and T3, the perceived availability of infrastructure has a strong influence on PEB intention (T2: $\beta$=0.390, $p<0.001$; T3: $\beta$=0.285, $p<0.01$) and PEB (T2: $\beta$=0.341, $p<0.001$; T3: $\beta$=0.208, $p<0.01$). The results illustrate the *behaviour-context* relationship: that people's PEB at home is significantly explained by the perceived availability of infrastructure. That is, individuals' PEBs at home are significantly determined by their perception of infrastructure available. The PEB of an individual in their home context is significantly determined by the perceived availability of infrastructure, thereby supporting H4.

**Table 4:** Results of regression analysis on availability of infrastructure, PEB intention and PEB

| **Independent variable** | **Dependent variable** | | | |
|---|---|---|---|---|
| | PEB intention (T2) | PEB (T2) | PEB intention (T3) | PEB (T3) |
| Gender | 0.193* | -0.122 | 0.184* | 0.031 |
| | *(2.236)* | *(-1.772)* | *(2.050)* | *(0.405)* |
| Age | 0.267** | 0.052 | 0.239* | 0.036 |
| | *(2.965)* | *(0.719)* | *(2.560)* | *(0.453)* |
| Education | -0.043 | -0.003 | -0.074 | -0.052 |

| | | | | |
|---|---|---|---|---|
| | *(-0.508)* | *(-0.044)* | *(-0.837)* | *(-0.706)* |
| Income | 0.176 | 0.042 | 0.219* | -0.043 |
| | *(1.927)* | *(0.582)* | *(2.288)* | *(-0.527)* |
| PEB intention (T2) | | 0.563*** | | |
| | | *(7.408)* | | |
| Availability of Infrastructure (T2) | 0.390*** | 0.341*** | | |
| | *(4.609)* | *(4.725)* | | |
| PEB intention (T3) | | | | 0.597*** |
| | | | | *(7.406)* |
| Availability of Infrastructure (T3) | | | 0.285** | 0.208** |
| | | | *(3.266)* | *(2.744)* |
| *Adjust* $R^2$ | 0.256 | 0.550 | 0.180 | 0.440 |
| *F* | 8.583*** | 23.382*** | 5.821*** | 15.406*** |

***Notes:***a.) *p < 0.05, **p < 0.01, ***p < 0.001. b.) PEB=Pro-Environmental Behaviour. c.) Results are shown as standardised beta coefficients with t- and F-values in parentheses.

The findings of this study are consistent with Dolnicar and Grün (2009), and Miller et al. (2015), which both state the importance of both contextual factor (i.e. availability of infrastructure) and attitudinal factor (i.e. PEB intention) in determining PEB. Our findings also support the ABC theory, which postulates that contextual factors explain behaviour together with attitudinal factors (Ertz et al., 2016; Stern, 1999). The findings provide insightful explanation regarding why tourists' PEBs at home are not aligned with their stated PEB intentions at a tourist destination.

This study differs from prior research asserting that people tend to be less engaged in PEB on holiday than they are at home (Barr et al, 2010; Dolnicar & Grün, 2009; Juvan et al., 2016; Miao & Wei, 2013). Instead, this study found PEB to be lower at home than in a tourism context. One major reason that can explain this discrepant finding is that this study was conducted at a sustainable tourism site (Dinghu Mountain Reserve) in China, which provides more available facilities (e.g. recycling bins) to enable environmental practices than are typically found at people's home contexts in China. Such finding also implies that we cannot simply conclude that PEB is lower or higher at a home or a holiday context; it is the availability of infrastructure in a given context that explains the level of difficulty to engage in the desired PEB.

## 5. Conclusions and Implications

This study responds to calls for further research to better understand spill-over effects

across behaviours, time and context (Hibbert et al., 2013; Hughes, 2013; Nilsson et al, 2017). Using longitudinal data, the current study has examined a time-lagged research model by elucidating the complex relationships between onsite PEB intentions, offsite PEB intentions and PEBs. In particular, individuals' PEB intentions have been assessed in both a tourism context and a non-tourism context, and the influence of the tourism-context PEB intentions on the PEBs at the non-tourism context has been investigated.

### 5.1. Theoretical implications

To date, longitudinal methods are rarely employed in the tourism literature (Lee et al., 2019), but our research suggests, with empirical evidence, that they should be. This is because the results of time-lagged SEM indicate that tourism-context PEB intention has limited impact on PEB at a non-tourism context, which highlights the importance of context change in affecting the actual conduct of PEBs. Although previous literature reveals that the impact of tourism experience on individuals' actual PEBs may fade over time (Hughes, 2013; Wu et al., 2015), the methodological contribution of the present research is that it empirically quantifies the relationships between onsite PEB intention, offsite PEB intention and PEB via time-lagged SEM. Consequently, this study provides a more nuanced understanding of the spill-over of PEB from a tourism to a home context, which serves to offer support for the continued use of longitudinal approaches (e.g. time-lagged models) to delve into the attitude-behaviour gap in PEB research. As Hughes (2013, 55) asserted "*This type of research, while difficult and time consuming, is imperative if we are to better understand and support widespread adoption of conservation practices*."

While there already exist a few research efforts regarding the "attitude-behaviour" gap in tourism literature (Ballantyne & Packer, 2011; Hughes, 2013; Juvan, & Dolnicar, 2014), the current study offers new insights into this gap. We did not find onsite PEBs intention to have a significant impact on offsite PEBs; rather, we found

PEBs were only strongly affected by PEB intention within the same context. This confirms earlier findings that the surrounding context overrides all of the cognitive factors included in PEB models (Stern, 2000). As we theorise, PEB is most significantly determined by the same-context PEB intention both geographically and temporally. The findings of this study also support the application of the ABC theory when delving into the formation of PEBs. The ABC theory postulates that individual behaviour is strongly context dependent, and the formation of the behaviour is a result of the interactions of personal attitudinal factors and contextual factors (Ertz et al., 2016; Guagnano et al., 1995). However, not many tourism studies have considered the role of context in affecting PEB changes. This study is among the first to associate the ABC theory with the variability of *PEB intention-PEB* link and fills the gap in extant tourism literature on PEB change.

The few past studies that have tested the difference between sustainable actions at home and in a tourism context were based on Western contexts (Dolnicar & Grün, 2009; Holmes et al., 2019; Miao & Wei, 2013), with the exception of Xu et al.'s (2020) study in China that did not adopt a longitudinal design and captured behavioural consistency rather than spillover. This study extends previous research from Western countries to China, a country that only launched strict recycling regulations in one city (Shanghai) in January 2019. The current research provides discrepant evidence from previous Western-based research (Dolnicar & Grün, 2009; Holmes et al., 2019), which reported that people tend to behave more pro-environmentally at home rather than at a tourism destination. We argue that the discrepancy can be explained by the change of context; in particular, by the change of perceived availability of infrastructure. This study, thus, casts new light on our understanding of the different levels of engagement in PEB between home and tourism contexts. It is both geographical and institutional context changes that matter (Nilsson et al, 2017).

### 5.2. Managerial implications and future research

It is important for the managers of tourist destinations and attractions to design tourist experiences with sustainability behaviours embedded in them, as the natural or most

599 convenient choices, to make them part of a social practice that increases PEB without
600 relying on PEB intentions (Smit & Melissen, 2018), and, in doing so, to reduce the
601 impacts of tourism on site. However, it is in the economic interest of tourism
602 stakeholders to be able to ground the moral justification of travel and tourism in the
603 current climate crisis on the industry's ability to demonstrate that the
604 disproportionately high environmental impacts incurred during a short holiday
605 (Lenzen et al, 2018) are justifiable through the long-term positive behaviour changes
606 achieved when tourists return home (Hehir, 2020). Hence it is worthwhile (but
607 complex) to conduct experiments to test which kind of interventions are most likely to
608 impact immediately on PEBs on site, as well as have a spillover effect across time and
609 location.

610 The findings of this study reveal that individuals' PEBs are context-specific,
611 based largely upon attitudinal and contextual factors in the same context. Thus, as
612 asserted by Holmes et al. (2019), encouraging tourist PEBs is not just about
613 sustainable actions in tourism settings; increasing daily PEBs in home settings is
614 imperative for policy makers to consider improvements to the environment that we
615 live in over the long term. Managers need to acknowledge that different mechanisms
616 to change behaviour may apply, according to the context. The limited impact of onsite
617 PEB intentions on offsite PEBs suggests that environmental educational programmes
618 at tourism destinations are ineffective in fostering behavioural change of PEBs. Policy
619 makers should not assume that "good practice case studies" can be wholesale
620 replicated to other contexts, and ought to put greater emphasis on which contextual
621 factors affect the ability of a policy intervention to achieve certain outcomes (Pawson
622 & Tilley, 1997).

623 This study found that availability of infrastructure (physical context) is
624 particularly important in shaping actual PEBs across different contexts (Steg & Vlek,
625 2009; Whitmarsh et al, 2018). A lack of necessary facilities, or lack of awareness of
626 such facilities, may limit the spill-over effect of a sustainable tourism experience on
627 daily PEBs. These findings have implications for tourism managers and local

628 government, whether in tourism or home settings, for example, allocating necessary
629 green infrastructure (e.g. recycling bins) and making these salient is imperative,
630 especially for communities with inadequate environmental/green facilities. Unlike
631 European countries, where recycling and garbage sorting are "normal" household
632 activities, with recycling bins set alongside residents' houses/flats, China began
633 launching strict new recycling laws for households in the City of Shanghai as recently
634 as 2019. The findings of this study further support the need to implement recycling
635 policies throughout China, and the need for local government actors to provide
636 corresponding facilities in order to motivate residents to act in a more
637 pro-environmental manner.

638 Tourism managers may find it easier to effect change in the contextual spaces
639 where people engage with the tourism product or service, than to effect change in the
640 antecedents of individuals' PEBs. Our study showed the importance of interpretive
641 signs in encouraging PEBs while holidaying. A further management implication is
642 that it is essential to increase awareness of infrastructure, and to make it easy for
643 individuals to use such infrastructure as part of their daily lives both as tourists and
644 residents. This requires further research to understand the meaning of engaging with
645 PEB for individuals and how that meaning is determined by different contexts
646 (Hibbert et al. 2013). For example, PEB in a public site may result from social norms
647 and peer pressure, whereas a similar behaviour at home (or lack of) may be explained
648 by habits and convenience.

649 This study has some limitations that may provide opportunities for future research.
650 First, due to difficulties associated with longitudinal data collection, the sample size
651 of the follow-up group is relatively small and data collection was limited to three time
652 periods. Further research could expand the sample size and include more data
653 collection time points to depict a better picture of temporal trends. Second, a
654 pre-survey measuring individuals' PEBs prior to them visiting the tourism site would
655 allow for a more robust assessment of the spill-over effect of tourism experiences.
656 Third, although the authors have examined the influence of social context on PEB

intentions in prior research, it would be pertinent to compare and contrast social bias along with physical context restrictions across contexts (between tourism and home contexts) in further studies. Many behavioural models use proxies for context, such as social norms, social networks or the availability of infrastructure (Hargreaves, 2011). It could be argued that rational behavioural models have reached their ability to explain PEB, and that future research should move away from such linear models of behaviour and use social practice theory to understand the middle level between agency and structure (Shove, 2010). This would allow a shift in emphasis towards transforming practices to make them more sustainable, rather than identifying personal characteristics of the consumers that can be used as antecedents to determine their intention to behave sustainably, or stimulating pro-environmental self-identity or social norms, which are likely to be short-lived or to create negative spillovers (Nilsson et al, 2017).

Social practice theory may enable ethnographers to shed some light on those social practices of Chinese consumers that result in them being prepared to behave more environmentally on holiday, while Western consumers are seen to do the opposite. Equally, a social practice theory approach may allow researchers engaging with tourism service providers to experiment with the designs of sustainability-oriented innovations in tourist service delivery. This would allow researcher/practitioner teams to nudge consumers towards PEBs without unnecessarily having to raise their awareness that the promoted behaviour has environmental benefits and, at the same time, being able to avoid any potential rebound effects. We encourage similar longitudinal research to be conducted across other countries/regions where social and physical contexts are different, to allow for further validation of the relationships between attitudes, behaviours and contexts.

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