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**RESEARCH ARTICLE**

# Education on sustainable tourism in biosphere reserves: A protection motivation theory approach

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## ABSTRACT

Community participation in sustainable tourism is crucial for biosphere reserves, but various factors can hinder it. Education can bridge this gap, yet research into sustainable tourism education in biosphere reserves is limited. Based on the Protection Motivation Theory (PMT), the research objectives of this research are (i) to design a non-formal sustainable tourism intervention, and (ii) to determine community members' perceptions of sustainable tourism after the intervention in the Marico Biosphere Reserve. Using a qualitative methodology with three focus groups and thematic analysis, the findings support a theory-based education intervention, as participants demonstrated awareness across the PMT dimensions and positive intentions towards sustainable tourism in the area. The learning outcomes covered the motivational phase, but a further recommendation is to incorporate a volition phase. By applying the PMT, the study provides (i) a theoretical foundation to understand the psychological mechanisms that influence community engagement in sustainable tourism; and (ii) demonstrates innovation and practical relevance in the design of education on sustainable tourism in biosphere reserves.

***Keywords:*** protection motivation theory; education for sustainable development; community perceptions; community participation; sustainable tourism; biosphere reserve

## 1. Introduction

Biosphere reserves are recognised as protected areas that collectively can achieve sustainable development goals[1]. The most successful biosphere reserves are those post-Seville Strategy that foster socio-ecological relationships[2-4], where meaningful, sustainable development is most likely to occur

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locally[5]. For many biosphere reserves' transition zones, communities can enhance the reserves' development function through sustainable tourism[6]; however, this implies their support and/or participation.

Numerous authors highlight a community intention–behaviour gap in different protected areas[7-9]. Huber and Arnberger[10] and Darvishmotevali et al.[6] report that while communities are willing to participate in biosphere reserves, their participation may be hindered by opportunity, perceived control, attitudes, environmental awareness, or the social environment. Notwithstanding the numerous reasons for non-participation, many scholars attribute this behaviour deficiency to limited information to make informed decisions[6, 11,12].

Education can help to address this, but in developing countries, communities often do not have access to formal education, inevitably necessitating alternative educational approaches[13]. Along with conservation and sustainable development, education forms part of the logistical functions of biosphere reserves and is officially guided by Education for Sustainable Development (ESD)[14]. To this effect, the Management Authority of the Marico Biosphere Reserve (the study site of this research) approached the researchers to assist with sustainable tourism education in the community. They identified sustainable tourism as one of the development routes suitable for the area. However, there is limited research on such local-level ESD actions[15], systematic practical guidance for designing ESD[16] and understanding the role of these educational interactions in biosphere reserves[14]. To address these gaps, the researchers turned to the Protection Motivation Theory (PMT) for two reasons. (i) Authors suggest that the PMT is important to stakeholders attempting to better communicate with communities to encourage participation[17], and (ii) designing ESD aligned to the PMT may be more effective[18]. This theory explains the impact of persuasive communication (an educational intervention) on protective behaviour (sustainable tourism), emphasising the cognitive processes mediating the behaviour change in individuals[19,20]. Community projects must focus on community perceptions regarding sustainable tourism as each context differs[21]. Their perceptions help us to understand their behaviours[22] and judgment on learning interventions[23] that can offer insight to research on sustainability[24]. By understanding their perceptions, practitioners may be able to design effective interventions to possibly bridge the intention-behaviour gap. Based on the PMT, the research objectives of this research are (i) to design a non-formal sustainable tourism intervention, and (ii) to determine community members' perceptions of sustainable tourism after the intervention.

# 2. Literature review

## 2.1. Protection motivation theory

The PMT (see **Figure 1** later) was originally developed in the health sciences to understand how people respond to persuasive communication regarding fear appeals[19]. A person's intention to participate in a mitigating behaviour is based on threat and coping appraisals[25]. The appraisal of the threat is not enough to encourage protected behaviour; however, the individual needs to feel they can do something about the threat (coping appraisal). Threat appraisal involves the person's perceptions about the *severity* of the threat, personal *vulnerability* to the threat, and the current rewards (*maladaptive rewards*) of ignoring the threat. Coping appraisal includes the person's perception of the effectiveness of the mitigating behaviour (*response efficacy*), their capability to perform the mitigating behaviour (*self-efficacy*), and the costs involved in performing the mitigating behaviour (*response costs*). A person will engage in the mitigating behaviour if the rewards of the threat (*maladaptive rewards*) and the costs involved in the mitigating behaviour (*response costs*) are low, while the other antecedents are high[25-27].

Although the Theory of Planned Behaviour, Norm Activation Model and Value-Belief-Norm Theory are used in numerous environmental behaviour studies, the PMT is better suited for stakeholders, like biosphere reserves, attempting to better communicate with communities to take action[17]. Among the persuasive theories, the PMT is categorised as a 'message effect model'[28] as it includes sources of information that initiate the cognitive process of threat and coping appraisals[20]. This cognitive process refers to Piaget's[29] cognitive learning process to either assimilate or accommodate information. The PMT is thus a suitable theory for this research that uses non-formal education (message) to possibly reach a protective outcome like sustainable tourism (effect).

Previous research concerning the PMT indicates that information played a key role in curbing the effects of typhoons[30] and reducing carbon emissions[11], but it did not influence willingness or actual donation behaviour to conserve birds[31]. These studies only used the PMT to assess the impact of an information intervention, with limited information about the design of the intervention. Although in the health sciences, Havaei et al.[18] incorporated the PMT into their intervention's design, arguing that an intervention's effectiveness is better when designed on a theory. Designing education for sustainable tourism using the PMT could arguably be an effective approach.

## 2.2. Education for sustainable development

Education for sustainable development "gives learners of all ages the knowledge, skills, values and agency to address interconnected global challenges including climate change, loss of biodiversity, unsustainable use of resources, and inequality"[32]. In a bibliometric review (1992 to 2022) of ESD research, most of the research aligns with the first four ESD priority action areas (policy, formal education environments, building capacity of educators, and youth), with less research focusing on local-level actions[15]. Even within the formal education system, little is known about the education and learning outcomes of ESD; however, experiential learning (combining cognitive and behavioral learning) is deemed promising[33]. It is therefore not surprising that research related to ESD in biosphere reserves follows a similar trajectory[34], with the notable exception of Gower et al.[14]. Notwithstanding the role of formal and informal learning, Almeida and Morais[13] argue that non-formal education can play an important role in addressing the SDGs by empowering communities. This type of education would typically be incorporated in biosphere reserves.

UNESCO[35] identified (1) **transformative action** for all educational approaches, stages (from information to behavioural change) and audiences (individual to communities); (2) **structural changes** (SDGs, the triple bottom line and contextual factors); and (3) the **technological future** (opportunities and challenges) as notions of ESD for 2030. These notions can be applied to the PMT in that information about the structural and technological aspects can be contextualised through the threat and coping appraisal processes to bring about transformation. Gower et al.[14] explain that meaningful transformative actions (context-specific sustainable behaviour) through educational activities remain challenging within biosphere reserves. In addition, ESD may be considered a "luxury" in contexts where livelihoods are at stake and thus requires a contextualised approach and emphasis on the fundamentals of human dignity[35]. This background gave rise to the conceptual model below (**Figure 1**).

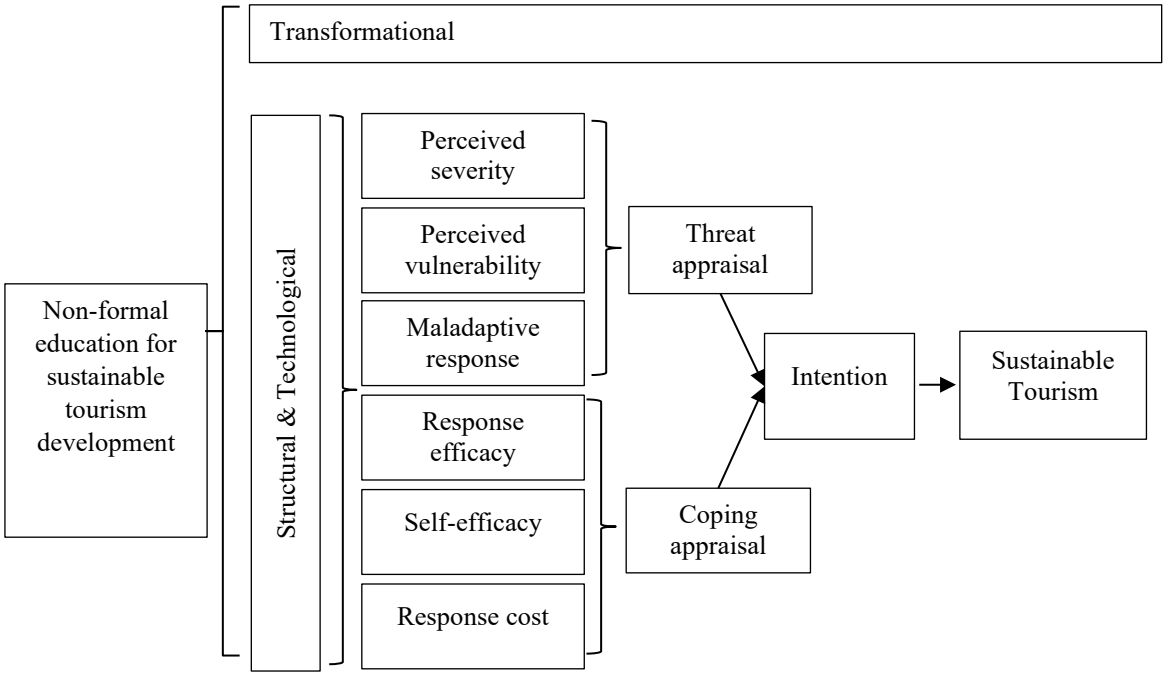


**Figure 1.** Conceptual model for non-formal education for sustainable tourism in biosphere reserve (ESTiBR).

*Adapted from: Kothe et al.[25], UNESCO[35]*

We propose that the PMT provides a theoretical explanation and guidance for the design of an educational intervention, based on the notions of ESD for 2030. Theoretically, if an educational intervention covers effective content, there should be a willingness to participate in sustainable tourism (transformation). Content should cover the context, the link between sustainable development/tourism and biosphere reserves (protective behaviour), and threats (perceived severity) to biosphere reserves and their vulnerability. The content should highlight the positive impact of sustainable tourism in their context (response efficacy) and how they can be involved (self-efficacy). Despite the community's realities (response cost), the premise is to create awareness that they cannot afford not to participate in sustainable tourism (low maladaptive response) owing to the benefits thereof. For clarity purposes, we will use education for sustainable tourism in biosphere reserves (ESTiBR) in this paper, with the assumption that such education is at a local level, using non-formal approaches.

# 3. Research method

## 3.1. Study site

The recently designated Marico Biosphere Reserve (see **Figure 2**) forms part of the larger dolomitic aquifer system in the North West, South Africa (SA). Its water resources form a valuable part of SA's natural heritage[36] and support large regions of SA and bordering countries[37].

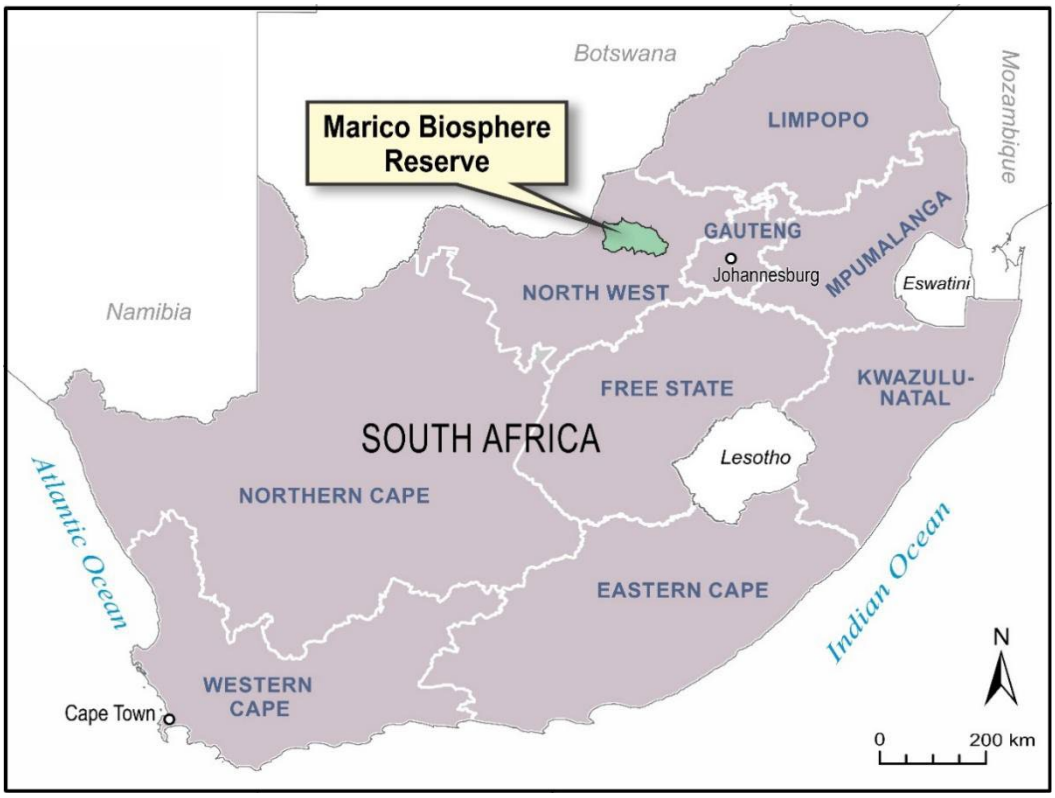


**Figure 2.** Location of the Marico biosphere reserve in SA.

Negative impacts like the destruction of wetlands, isolation of biota, exotic bass, habitat loss, alien and invasive vegetation[37], and prospecting mines[38] pose threats to the area's natural resources. As part of an ongoing project in the reserve, the Management Authority approached the researchers to assist with sustainable tourism education in the community.

### 3.2. Participants

Ethics clearance was obtained from the College Research Ethics Review Committee, certificate number 2020_CRERC_015(FA), before participants were recruited. The Marico Biosphere Reserve has an approximate population of 34,000 permanent residents and 53,000 seasonal residents[37]. Owing to the recent designation of the biosphere reserve, a population list was unavailable, which required two non-probability sampling techniques[39]. (i) The Marico Biosphere Reserve assisted with the contact details of a broad spectrum of stakeholders from which a convenience sample was drawn to send the electronic invitation. (ii) A snowball sampling technique was employed as the initial sample forwarded the invitation to other interested parties. Participants received an information sheet and informed consent was given. Screening questions ensured that participants were residents of the reserve, fluent in either English or Afrikaans and over 18 years of age. The final sample comprised 17 participants (11 males and 6 females), with backgrounds in tourism (4 in the accommodation sector, 1 intermediary, and 1 food and beverage sector); teaching (1); reserve management (1); management (1); and farming (3); while others were retired (4) or unemployed (1). Since the purpose is to gain in-depth knowledge regarding a situation (i.e. perceptions on sustainable tourism after a non-formal intervention), small sample sizes are common in qualitative research that aims for data saturation[40]. In terms of the focus group sampling requirements (see data collection later), Savin-Baden and Howell Major[41] explain that a minimum of three focus group interviews on the same topic is required for common themes to emerge and saturation to be achieved. In terms of participants per focus group, Savin-Baden and Howell Major[41] recommend 4 to 5 for mini-focus groups or 6 to 8 for standard

focus groups. Similarly, Creswell[42] advises 6 to 8, while Walden[43] recommends 6 to 12. Ours consisted of 5, 6 and 6 participants for the three focus groups, respectively.

### 3.3. Intervention

The non-formal educational intervention was a half-day workshop that took place on 5 October 2022. The workshop took 1.5 hours using a PowerPoint presentation to impart the content and was presented in English. The intervention and learning outcomes were based on the PMT, the researchers' experience with contextual realities of the area, and several authors' recommendations[35,44-50] (see **Table 1** later). Experiential learning was addressed through two-way communication and probing reflections from the participants[33]. To minimise facilitator bias and improve accountability, all three researchers presented different sections of the content and were present throughout the session.

### 3.4. Data collection

The constructivist and interpretivist philosophies were adopted to acquire social contexts and realities based on interactions and interpretations of participants[38]. For this exploratory research, qualitative methods were employed to "capture richer data in regard to understanding and knowledge of sustainable tourism that may not be readily uncovered with cursory quantitative data"[44,10].

Following the intervention, focus group interviews were conducted to gather data on perceptions of sustainable tourism. The focus group approach allowed both individual and collective views to emerge. Our interest with the focus group was rather to ascertain participants' perceptions of sustainable tourism after the intervention than to assess the learning that took place. The three researchers simultaneously conducted one focus group each to allow more data to emerge, and these ranged from 46 minutes to one hour. Participants with different backgrounds (e.g. tourism, farming, and teaching) were grouped to avoid one context dominating the discussions.

The research instrument consisted of eight questions to probe the different PMT dimensions (see **Table 1**). Ideas for the questions were sourced from Bockarjova and Steg[51], Janmaimool[52], Jilani et al.[53] and Kothe et al.[25]. The same order of questions and prompts was used in each focus group to align approaches as far as possible. However, where a researcher felt that a concept must be explored further, they had the flexibility to probe within the question to draw out individuals and different opinions. This facilitation was conducted until no new themes emerged.

The free-flowing flexible form characterising small groups was ideal for encouraging discussion and collecting data and produced new knowledge and insights into participants' perceptions of sustainable tourism[39]. Interviews were recorded and later transcribed. Where participants had spoken Afrikaans, text sections were translated into English. The translated text was peer reviewed to check for possible errors since all three researchers are fully conversant in Afrikaans. The three transcriptions were checked against the recordings, cleaned, and imported to Atlas.ti[54] for qualitative analysis.

**Table 1.** Alignment of intervention learning outcomes, PMT dimensions and research instrument.

| Learning outcomes for the workshop | | PMT | | Code definition | Question |
|---|---|---|---|---|---|
| 1. To increase the low public awareness of biosphere reserves and in particular the definition, functions, zoning, and relevance of the study site | ESD Notions: Transformational, Structural and Technological | Threat appraisal | Perceived severity | Belief about the seriousness/severity of the consequences of the threat/risk/harm (in general). | 1. What is your understanding of the threats/risks facing the Marico Biosphere Reserve? |
| | | | Perceived vulnerability | The individual's belief about vulnerability/susceptibility to suffering the consequences of the existing threats. | 2. How are you vulnerable to these threats/risks? |
| | | | Maladaptive response awards | The intrinsic and extrinsic benefits of neglecting/ignoring a given protective behaviour. | 8. Are there any benefits to not pursuing sustainable tourism for the Marico Biosphere Reserve? |
| 2. To provide a basic understanding of sustainable tourism, including its (+/-) impacts. | | Coping appraisal | Response efficacy | The belief that the protective behaviour will effectively avert/mitigate the threats (in general). | 3. How do you believe sustainable tourism can assist in mitigating the threats/risks? |
| 3. To provide a basic understanding and inter-relationships of sustainability's triple bottom line for biosphere reserves | | | Response costs | The monetary and non-monetary costs associated with carrying out the protective behaviour (in general). | 7. What obstacles can you identify that will impact the achievement of sustainable tourism in the Marico Biosphere Reserve? |
| 4. To illustrate how community members can get involved in sustainable tourism by providing context-specific examples | | | Self-efficacy | The individual's belief about their ability/capability to perform the protective behaviour. | 4. Does anyone feel they do not have a role to play in sustainable tourism in the Marico Biosphere Reserve?<br>5. After the presentation, how are you now equipped to contribute to or participate in sustainable tourism?<br>6. What will you now do as an individual to participate in sustainable tourism? |

## 3.5. Data analysis

Thematic analysis[55] was used to identify the main themes and sub-themes. First, transcribed data were read (familiarisation), followed by initial codes generated in Atlas.ti by one researcher. The dimensions (e.g. perceived severity) of the PMT formed the deductive codes, which became the main codes. Inductive codes were used to develop sub-codes (e.g. 'mining'). Memos in Atlas.ti were compiled to explain the criteria for main codes. To add reliability, the other authors then coded the data, checking differences from the first coding and documenting the process through memos. Differences were discussed, and code memos were revised to reflect the changes and ensure consistent coding (see **Table 1**). Finally, the coding frame was cleaned and finalised. The process was iterative, going back and forth between codes, sub-codes and quotes as new insights emerged. A priori thematic saturation was reached as the data collected exemplified several sub-codes per main code of an existing theory (PMT) as opposed to developing codes to form a new theory[56]. Codes and sub-codes are indicated with single quotation marks. Each quote is in double quotation marks and referenced (e.g. T1 = transcript 1; M3 = male participant 3; F1 = female participant 1). Where deemed necessary, contextual information (contextual reflexivity) was added to understand the relevance of

the results. Only the results of the most prominent codes (those with the most quotes) that addressed our research aim are presented.

# 4. Findings

The findings are presented under the (i) threat and (ii) coping appraisal processes of the PMT.

## 4.1. Threat appraisal

The summarised results of threat appraisal are presented in **Table 2**.

**Table 2.** Summarised threat appraisal results.

| | Codes | Quotes | Sub-codes |
|---|---|---|---|
| Threat appraisal | Perceived severity | 22 | Poverty<br>• Crime<br>• Environmental degradation |
| | | 16 | Roads and infrastructure<br>• Residents<br>• Tourists |
| | | 12 | Mining<br>• Uncontrolled<br>• Incongruent with tourism<br>• Damage |
| | | 11 | Water and water quality<br>• Dependency<br>• Governance |
| | | 5 | Mobile reception |
| | | 4 | Politics |
| | | 4 | A lack of participation |
| | | 3 | Quality and reputation |
| | | 3 | Fish at Eye |
| | | 3 | Litter and dump site |
| | | 2 | Load shedding |
| | | 2 | Tree felling |
| | | 2 | Climate change |
| | | 2 | General |
| | | 1 | Size of task |
| | | 1 | Roundup |
| | | 1 | Fire |
| | | 1 | Farm commercialisation |
| | | 1 | Non-resident farmers |
| | | 1 | Overdevelopment |
| | Perceived vulnerability | 14 | Loss of income<br>• Town impression<br>• Roads |
| | | 9 | Emotional and custodian<br>• Overcome |
| | | 7 | Quality of life |
| | | 7 | Security<br>• Tourists<br>• Residents |
| | | 6 | Emergencies |
| | | 3 | Quality and Reputation |
| | | 2 | Accessibility |
| | | 1 | Insufficient knowledge of sustainable tourism management |
| | | 1 | Not vulnerable |
| | Maladaptive response awards | 10 | High maladaptive response<br>• Money<br>• Doubts |
| | | 6 | Low maladaptive response |

#### 4.1.1. Perceived severity

Out of all the dimensions of the PMT, 'Perceived severity' received the most attention. Twenty threats were identified, revealing an understanding of perceived severity. Most quotes belonged to the threats of 'Poverty' (22) and 'Roads and infrastructure' (16), followed by 'Mining' (12) and 'Water and water quality' (11).

Several quotes linked 'Poverty' to crime and/or environmental degradation due to pure need. This is linked to the need for job creation, which is limited by the small-scale nature of tourism in the reserve:

"As long as you got poor people, all they're thinking about ... just to survive, they don't give a damn about cutting this tree because they need ... to cook, ... So, for me, point number one ... in the biosphere is ... job creation. ... then they got time to listen to other stuff. If they don't have jobs, they don't feel a damn about environmental stuff/conservation" (T1, M3).

M2 stated that "there at the squatter camp, there's no warthogs anymore, and a lot of small animals, there's nothing left, they are poaching ..." (T1, M2). F1 interjected to state "That's poverty ..." (T1, F1) to which M2 replied, "Because of that, they wipe out everything that lives" (T1, M2). In T1, a discussion followed on poaching severity, not only as a general threat but also for individuals who have been affected personally (e.g. T1, M2; T1, M1). Poverty was also linked to other crimes such as burglaries (T1, M3) and decreased safety on farms (T1, M3).

In terms of 'Roads and infrastructure' as a threat, the condition of the roads and the resultant difficulty for tourists and residents alike are clear and linked to poor governance:

"For the first time ever ... I have to ask guests 'Just tell me, what type of car do you drive? ... Those of us who ... have guesthouses, there are people who no longer want to come because they don't have a 4x4 …, they just have a sedan" (T2, F1).

"If ... I am nailed by a mamba [snake] out there, I am dead meat. I will not get to hospital in time" (T3, M2).

"... we had the Department of Roads guy out here last year because our roads haven't been graded for five years now… And he ... said ... they put in a budget last year for diesel, for the graders, and by some accident they put R4 million less in, so they don't have diesel to grade" (T2, M3).

'Water and water quality' was another code used several times. It was linked to the dependency and governance. Concerning dependency, quotes related to the unique cleanliness of the river water and how this must be protected, for example: " For me, that would be the end of Marico if the water went" (T2, F1).

Three participants mentioned the threat of sewage, which directly links to governance, for example, "... the main idea of UNESCO is to save our water, our air and our ground, correct. We're sitting in Groot Marico, with sewage that's running ... into the Marico River; the ... brand new water plant that cost R17 million is ... not working because they [referring to local municipality] can't have the electricity switched on" (T1, M1).

'Mining', which is a long-term threat being fought by the community, is uncontrolled and incongruent with sustainable tourism. For example, one participant mentioned that there were currently seven mining applications and raised concerns about uncontrolled mining and a lack of rehabilitation (T1, F1). Another participant listed several types of mining threatening the reserve ["Copper, cobalt, diamonds, gold, nickel ... slasto ..." (T3, M2)]. The concern is that mining is incongruous with sustainable tourism, and very damaging to the environment:

"... On the one hand, you get the mines – land use not sustainable. And on the other hand, you get sustainable tourism – [they are] opposites. Whatever they [mines] do threatens [sustainable tourism]" (T3, M3).

"They chop all the minerals off. … they [mines] will ruin everything in a month's time" (T3, F2).

'Water and water quality' also links to the code 'Mining'. The following quotes highlight concerns about damage to the unique, sensitive dolomitic aquifers and the river system:

"They [mines] want to frack near the ... Marico Eye area ... and they [people in general] say they can bore down into the ... aquifers and then cause ... huge damage" (T1, F1).

"... people forget about all these other communities that live on these river systems – Botswana, up in Limpopo and Mozambique. ... Take all this water out and all these other communities collapse" (T2, M2).

**4.1.2. Perceived vulnerability**

'Perceived vulnerability' was the second highest code that participants commented on, with nine sub-codes generated. Most of the codes belonged to 'Loss of income' (14), 'Emotional and custodian' (9), 'Quality of life' (7), 'Security' (7) and 'Emergencies' (5).

Linked to tourism, 'Loss of income' is related to first impressions of the local town and the condition of the gravel roads. "… Because, as a tourist myself, … if you walk, … drive into a broken downtown, even though you've got the biosphere and all stuff, you think, 'Oh, my gosh, where am I going to stay? Do I want to stay here? Is it safe? Can I walk in the streets?'" (T3, F1). Similarly, M1 explained, "We got bookings in the guesthouse for a … few days and the people … stay only one night and [bring] back the keys and say, no, they can't use this road." (T1, M1). 'Loss of income' was also linked to game and cattle poaching. M1 explained, "Two weeks ago, I lost a 52-inch kudu bull" (T1, M1). Similarly, M2 stated that "… [poaching] … very much affected me. … I've lost about 30 cattle. … I'm not … a big farmer. A lot of … small, beautiful wildlife – the reedbucks … have all been obliterated" (T1, M2).

Under 'Emotional and custodian', participants reflected on environmental threats. While these threats remained personally relevant, they mostly referred to a sense of responsibility to overcome them:

"… I feel as custodian of this area, I must be responsible. And anything that threatens this environment, and not just emotionally, but also what you can see out of facts, I will fight it" (T1, F1).

"I am one of the few people in Marico, who still lives on that farm for generations, from 1838 … so I have this passion to protect what we are, where we are living" (T1, M2).

Several threats have an impact on the wider community's 'Quality of life', such as irresponsible behaviour and the effect on nature (T2, F1); the effect of water pollution and the ripple effect on other communities along the rivers (T2, M3); and the strain of load shedding, which disrupts daily activities (T2, F1).

Participants mentioned that poaching activities impacted their and the tourists' 'Security'. "… your guests doesn't want to come to your farm if they find a snare, there's people walking [on] your farm. Now it's your safety" (T1, M3). Furthermore, regarding other crimes impacting on 'Security', M3 explains, "And the way it [limits opportunities for the community] affects us, is break-ins [burglaries] … That's the way it affects our businesses and tourism, … if there's a lot of car thefts or break-ins, or whatever, the tourist is going to say, 'Listen, I can't go to Marico'" (T1, M3).

'Mobile reception' affects tourists and residents alike, particularly in 'Emergencies': "The visitors … get a puncture up there on the hill, middle of the night. There's no cellphone [mobile] reception, there's no

light. … these are sort of city people who don't know how to get out and change a tyre, and they want to phone for help and there's no reception up there" (T1, F1).

#### 4.1.3. Maladaptive response

Sixteen quotes were coded, with two main categories identified: (i) the reasons why other people would not respond positively to avert the threats ('high maladaptive response'), and (ii) the reasons why they would ('low maladaptive response'). With participants being stakeholders in the biosphere reserve, they are classified in the second category.

For 'High maladaptive response' (10 quotes), participants provided reasons why other people might not heed the call to sustainable tourism, which related to (i) money and (ii) doubts. Firstly, the alternative use of money was mentioned. F2 (T1) referred to the very rich not needing to be involved in sustainable tourism.

"Unfortunately, if you [want to] protect the environment, you have to give money. And 50% of your middle class is going to think, 'I'm not going to give money ... I'd rather spend that 50% on buying a new car or whatever" (T1, M3).

Secondly, there is the perception that mining could be a better source of income. T3, F2 stated that although "everybody" is angry with the anti-mining movement because they want jobs, jobs for locals would not materialise because the mines would "... bring their own specialised people" (T3, F2).

Doubt is the second 'High maladaptive response'. These responses can be extreme, such as community members' attitude that "... we're in any case in trouble ... nothing's going to stop it, we're going downhill ..." (T1, M1); or more measured, such as the response mentioned by an invested individual (F1 in T1) that "... being part of this process from the beginning, isn't there a time frame of evaluation by UNESCO to see ... are you still on standard? ... then I'm worried ... did we reach [it]?"

'Low maladaptive response' (six quotes) relates to reasons not to neglect behaviours that lead to sustainability:

"... even before the biosphere was here ... this place ... always had that reputation to be a place to get away to. There's not many other things that this area can really tap into besides farming" (T2, F1). M1 then added that farming further up the river was not viable, leaving tourism as the best option (T2, M1).

### 4.2. Coping appraisal

The summarised results of coping appraisal are presented in **Table 3**.

**Table 3.** Summarised coping appraisal results.

| | Codes | Quotes | Sub-codes |
|---|---|---|---|
| Coping appraisal | Response efficacy | 10 | Economic<br>• Positive effects<br>• Alternative to mining |
| | | 6 | Awareness and education |
| | | 4 | Environment<br>• Positive effects<br>• Counteract mining |
| | | 3 | General |
| | | 1 | Doubt |

| Codes | Quotes | Sub-codes |
|---|---|---|
| Self-efficacy | 26 | Things we can do |
| | | • Improvements |
| | | • Education |
| | | ○ Biosphere reserve |
| | | ○ Environment |
| | 12 | Responsibility |
| | | • Theirs |
| | | • Others |
| | 3 | I have a role to play |
| Response costs | 5 | Effort |
| | | • Fundraising |
| | | • Involvement |
| | 3 | Education |
| | | • Youth |
| | | • Local community |
| | 3 | Laws |
| | 2 | Training |
| | 2 | Cohesion |
| | 2 | Funding |
| | 2 | Participation |
| | 1 | Chicken and egg |

**Table 3.** (*Continued*)

### 4.2.1. Response efficacy

Five sub-codes emerged for this code. The effectiveness of sustainable tourism was aptly captured by one respondent: "I think sustainable tourism, in capital letters with exclamation marks behind it, is the only way ..." (T3, M2).

For the participants, sustainable tourism had the strongest link to 'Economic' aspects: Participants recognised the opportunities for bringing in money (T3, F1), employment (T1, F2), infrastructure development (T2, M1; T3, F1), and the multiplier effect to other industries (T2, M2). The economic benefits of sustainable tourism were also compared to what the mining industry would have offered:

"… he [referring to an expert who addressed the community before declaring the biosphere reserve] actually mentioned that through studies they've realised that tourism actually brings in more money and economic growth to an area than what mining does" (T2, F1).

"... to get the tourism thing to work so that people can feel they are benefiting from that. Because ... to a large extent [that] will counter the mines as well" (T3, M3).

### 4.2.2. Self-efficacy

'Self-efficacy' had three sub-codes, namely 'Things we can do' (26), 'Responsibility' (12), and 'I have a role to play' (3). 'Things we can do' had more quotes than any other sub-code in the data set.

The three focus groups were firm that they did have a responsibility towards sustainable tourism ('I have a role to play'). Participants were then requested to indicate how, following the intervention, they felt equipped to contribute to or participate in sustainable tourism. This led to the sub-code 'Things we can do'. Participants mentioned low-effort activities like improving things they were already doing in tourism establishments (T1, M1; T2, F2), picking up litter where they went (T3, M2), and low-cost improvements to the town's scenery (T3, F2). It was striking how enthusiastic the participants in focus group 3 became after the following suggestion:

"To make that practical, ... we must get together again on our own, and we must sort out the calendar for the next year, in terms of the community actions, and we must decide this is our strategy and our plan for December. This is how we're going to use this network, to do something for December" (T3, M1).

After this suggestion, several plans were presented, like sharing information to the benefit of everyone (T3, F1; T3, M1), and working from a central position (T3, F2).

Most of the actions that participants mentioned related to educating visitors and the wider community on (i) the biosphere reserve and (ii) environmental aspects:

"... education is really key ... You wouldn't know what it [the biosphere reserve] is about. And I do ... So we need to go and tell other people. My neighbours might not know about it. At least I can have a chat about it or even tell my guests about it, ... which is very vital at the end of the day" (T2, M2).

"I would love to be able to sit in the river with school kids and say to them, let's turn over this stone. Look at those little things there [referring to insects]. Do you know what they mean? What is the significance? How do they interact? Why are they important? Things like that excite me, that fires me up" (T3, M2).

In terms of 'Responsibility', most participants indicated that they had a responsibility, but some participants believed, or indicated that other people thought, that certain activities were the responsibilities of larger bodies:

"... there is sewage running, not only into the river itself, but also ... behind the butchery, running into the veldt and ... I think UNESCO or the Biosphere must do something about that. I think it's their responsibility" (T1, M1).

"... I get the impression that the local people feel like the Biosphere's there to save them… But people don't understand that the concept of the Biosphere is for you to get involved, ... instead of just sitting back and waiting for things to happen" (T2, F1).

"... I think, the threat that we are experiencing from the Biosphere Reserve management side is the fact that people see it as something that was established that will do a lot of things for us. ... Which is not true. … but ... what you presented here today, showed to us very clearly, all of us must pull together ..." (T3, M3).

**4.2.3. Response cost**

To assess 'Response cost', participants were asked to identify obstacles that would have an impact on the achievement of sustainable tourism in the Marico Biosphere Reserve, resulting in eight obstacles (sub-codes). Most of these were things that participants needed to make sustainable tourism work.

'Effort' would be required to raise funds for local people (T2, F1) and involvement:

"And if you start doing it, people will start following your example. So sometimes you cannot just wait for everyone to agree. You just got to do a little bit here, a little bit there. Then someone will say, 'That was easy. I can do that'" (T3, F1).

"But you can't do everything on your own. So, you have to decide what you would like to do the most" (T2, M1).

'Education' re-emerged in the context of youth (T1, F2) and the local community, for example: "... going into poor communities, educating them on the environment. ... 'Listen, look what happened to this piece of plastic', and show them, practical education" (T1, M3). 'Laws' referred to the need to comply with laws that govern the transportation of tourists by a tour guide (T2, M3) and the restrictions imposed on tour guides (T2, M1).

# 5. Discussion

This section presents a thematic summary of the (5.1) threat and (5.2) coping appraisal processes of the PMT and thereafter (5.3) a holistic view.

## 5.1. Threat appraisal

'Quality of life' was linked to two technological notions of the ESD, namely 'Mobile reception' and 'Loadshedding', emphasising technology as a challenge (it was not mentioned as part of a solution ('Response efficacy')). Except for 'Climate change', most of the threats expressed by participants were structural, context-specific (e.g. 'Mining') and linked with some of the SDGs. 'Poverty' links directly to the "no poverty" SDG[57]. In a bibliometric review, Merigó et al.[58] report that research into sustainability, poverty and community planning is popular, and often consulted. The poverty-environment relationship has been a central theme in development literature that frames poverty as leading to environmental degradation[59,60]. This degradation is because communities might struggle to become stewards of the environment if they feel their basic needs are unfulfilled[61]. It is therefore unsurprising that participants ascribed the associated vulnerabilities of 'Loss of income' and 'Security' to unmet basic needs, which led to poaching.

The 'Roads and infrastructure' and 'Water and Water Quality' threats relate to the "industry, innovation and infrastructure" and "clean water and sanitation" SDGs, respectively[57]. According to the participants, these threats are linked to vulnerabilities of 'Loss of income' owing to poor road infrastructure and 'Quality of life' due to the sanitation situation. According to Thacker et al.[62], infrastructure influences the attainment of all SDGs, and associated issues may lead to harmful social and environmental impacts. Interestingly, participants viewed sustainable tourism ('Response efficacy') ('Economic' and 'Environmental' solutions for 'Poverty' and 'Mining') and their inherent values ('Emotional and Custodian') as the solution to these threats. The latter specifically aligns with Chen's[63] 'moral obligation', which is the ethical behaviour one would expect in protected areas. It is perhaps not surprising that the respondents had 'Low Maladaptive' views.

Respondents also highlighted that the wider community might not view sustainable tourism through the same lens ('High Maladaptive' views). From a developmental perspective, activities related to tourism development are often also related to sustainable development, but not all stakeholders view it this way[64]. Scheyvens and Monsen[65] argue that tourism is not necessarily synonymous with poverty reduction, but to contribute, a broader approach is required that appreciates social and environmental values. Similarly, Kanwal et al.[66] report a positive relationship between road development and a community's support for tourism. If collaboration in sustainable tourism is required, it should be integrated with the local area's development[35,64].

## 5.2. Coping appraisal

Many of the 'Response costs' align with Zhang et al.[12], Huber and Arnberger[10], Darvishmotevali et al.[6], and Li and Lui's[11] explanations for the information-behaviour gap: opportunity ('Training' and 'Funding'), perceived control ('Laws'), attitudes ('Cohesion'), environmental awareness or limited information ('Education'), and the social environment ('Cohesion' and 'Participation'). Although various 'Response costs' identified were contextual, participants felt sustainable tourism could enhance the 'environmental' and 'economic' situation ('Response efficacy'), and their positive attitudes framed these as something they needed to achieve. They mentioned that their role ('Self-efficacy') was related to activities with minimal costs and effort, illustrating cognisance that they can have a role despite their background.

Similar results were found in a waste management study[52]. Participants also responded that they could 'Educate' the wider community, which is deemed a worthy cause as the literature supports the notion that the biosphere reserve label is relatively unknown and requires awareness[45-47].

Of concern, however, is whose 'Responsibility' certain behaviours are. This aligns with the findings of Oakley et al.[17], who measured "ownership appraisal" using the PMT to account for people's perception that certain behaviour is not their responsibility. Hedden-Dunkhorst and Schmitt[67] explain that biosphere reserve managers are frequently confronted with what the biosphere reserve designation means to the community and how they can contribute. For sustainable tourism to be successful, community groups must agree to take the activities forward[64].

### 5.3. A holistic view

The positive perceptions of participants in this research correspond with previous findings showing that information does have an impact on intentions[8,11,30] and thus support our learning outcomes for ESTiBR. The quotes on 'Perceived severity' and 'Perceived vulnerability' (threat appraisal) far outweighed quotes about other PMT dimensions. This may be an indication of the negativity bias tendency to pay more attention to negative than positive information[68]. While there were high coping appraisal perceptions, only focus group 3 exhibited planning behaviour beyond our intentions, perhaps highlighting a limitation in our intervention's design. Karki and Hubacek[22] argue that interventions must focus on all parts of the process, from awareness to behaviour.

## 6. Implications

The following practical and theoretical implications are presented.

### 6.1. Practical

While this study was exploratory and context-specific, the practical implications of ESTiBR's design (learning outcomes) could apply to other biosphere reserves. Their curricula, however, will be context-specific.

In terms of learning outcome one, understanding the perceived severity and perceived vulnerability factors a community face gives insight into the design of ESTiBR and contextual development requirements of the area that must be addressed. Rather than arguing a cause-and-effect relationship between education and development, it must be viewed as two sides of the same coin. However, this paper only deals with the education component to support sustainable development.

While it is inevitable to focus on the importance of conservation due to negative impacts in socio-ecological areas like biosphere reserves in ESD, the negativity bias emphasises a stronger pro-sustainable tourism approach within ESTiBR. The coping appraisal content, specifically the benefits of sustainable tourism (response efficacy) to all life domains can be amplified (learning outcomes two and three). ESTiBR also requires a strong emphasis on self-efficacy in underdeveloped rural areas (learning outcome four). The contextual factors, like poverty in this research, make it difficult for community members to participate in sustainability while trying to survive. Knowing the contextual threats enables designers to incorporate more self-efficacy examples that could overcome these threats. By also framing low-cost and effort actions (e.g. using water sparingly) within the community's means, could lead to a behavioural spillover to more difficult actions (e.g. installing water-efficient appliances) in the future, as Lauren et al.[69] suggest.

ESTiBR requires a fifth learning outcome dedicated to some form of behaviour activation to truly be transformational. Curious about how we could amplify more behaviour like focus group 3 exhibited,

Schwarzer's[70] post-intentional volition phase seems promising to include. This author developed the Health Action Process Approach (HAPA) to overcome the notorious intention-behaviour gap of other health behavioural theories. Schwarzer[70] explains that intentions are formed in the motivational phase and implemented in the volition phase, which consists of (i) action planning (addressing where, when, and how) and (ii) coping planning (overcoming obstacles in the implementation of plans). The 'World Café'[71], a collective thinking process to create actionable knowledge, or 'Future Search'[72], a planning meeting to search for common ground, could be considered to stimulate action. Enabling the community to plan for problem-focused events also increases collective efficacy, which has proven to increase the uptake of preventative behaviours[73,74].

'Responsibility' was an interesting result, which made us realise that there are perceptions that some sustainable tourism actions are better suited for specific stakeholders. Designing interventions per stakeholder group (e.g. Management Authority vs tourism entrepreneurs) could be valuable, or to incorporate 'responsibility' into the planning component (volition) of the intervention.

### 6.2. Theoretical

While the PMT originated in the health sciences, it has been applied in numerous other contexts, including socio-ecological and sustainable tourism contexts. In this study, similar results were found to other authors who suggest an extension of the PMT. Extending the PMT to include 'Responsibility' (ownership appraisal)[17] and 'Emotional and custodian' (moral obligation)[63] seems plausible. Also, considering that the PMT is limited to the motivational phase[16,70], extending the PMT with action and coping planning (volition) can be considered. Perhaps an alternative or new theory is required for socio-ecological contexts and/or ESTiBR. As McCabe[75] explains, the tourism discipline tends to import theories or incorporate ideas from other disciplines, but its characteristics differentiate the discipline and make it worthy of building its own theories.

## 7. Conclusion

Recognising the challenge of community participation in sustainable tourism in biosphere reserves, this research aimed to determine community members' perceptions of sustainable tourism following a non-formal educational initiative. Biosphere Reserves rely on education to bridge the intention-behaviour gap, which can aid in collectively addressing SDGs. Our research corroborates that information (via a non-formal intervention) changed the community's intentions to behave. This paper contributed towards ESD research at the (i) local level and more specifically in (ii) biosphere reserves and (iii) sustainable tourism. The novelty of the paper is in the use of the PMT to (i) design an intervention on sustainable tourism, and (ii) analyse community perceptions on the intervention. Our research corroborates the ESTiBR's design; however, adding a volition phase (fifth learning outcome) is recommended to narrow the intention-behaviour gap.

While this exploratory research's findings were novel, the study had some limitations. The sampling techniques caused a selection bias; however, as a precautionary measure, a diversity of participants was grouped into focus groups so that one context did not dominate the discussion. Although the study did adhere to qualitative methodological sample and focus group size guidelines, and delivered rich data that addressed the research objectives, additional participants could have delivered further nuances. A common challenge in bottom-up frameworks is to get a wider spectrum of stakeholders involved. We also acknowledge other factors that could have influenced the findings, like the effect of other participants during the focus groups. The contextual findings are also relevant to the specific study site, and the realities of other reserves could result in different nuances. As indicated, the intervention's design did not capitalise on a volition phase, so

future research may consider this and apply an appropriate theory or conceptualise a new theory to this effect. More academic-praxis research is recommended for ESD to delve deeper into the motivational and volitional phases, especially in communities. As these interventions are mostly attended by semi-involved stakeholders, more research is required on how to reach the uninvolved stakeholders. Longitudinal and/or mixed-method research can examine the impact of ESD on community empowerment and how to adapt ESD even further and generalise findings with large samples.

## About the author

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## Author contributions

Conceptualisation, Elricke Botha, Dorothy Queiros, and Nicolene Conradie; methodology, Elricke Botha, Dorothy Queiros, and Nicolene Conradie; fieldwork, Elricke Botha, Dorothy Queiros, and Nicolene Conradie; coding and analysis, Elricke Botha, Dorothy Queiros, and Nicolene Conradie; writing-original draft preparation, Elricke Botha and Nicolene Conradie; writing-review and editing, Dorothy Queiros; project administration, Elricke Botha; funding acquisition, Elricke Botha. All authors have read and agreed to the published version of the manuscript.

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## Conflict of interest

The authors report there are no competing interests to declare.

## References

1. United Nations Educational, Scientific and Cultural Organization (UNESCO). Lima Action Plan for UNESCO's Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves (2016–2025). Available online: https://unesdoc.unesco.org/ark:/48223/pf0000381215 (accessed on 10 October 2025).
2. Pool-Stanvliet R, Coetzer K. The scientific value of UNESCO biosphere reserves. *South African Journal of Science* 2020; 116(1/2): 1–4. https://doi.org/10.17159/sajs.2020/7432
3. United Nations Educational, Scientific and Cultural Organization (UNESCO). What are biosphere reserves? Available online: https://www.unesco.org/en/mab/wnbr/about (accessed on 10 October 2025).

4. Van Cuong C, Dart P, Hockings M. Biosphere reserves: Attributes for success. *Journal of Environmental Management* 2017; 188: 9–17. https://doi.org/10.1016/j.jenvman.2016.11.069
5. United Nations Educational, Scientific and Cultural Organization (UNESCO). Education for Sustainable Development: a Roadmap - ESD for 2030. Available online: https://unesdoc.unesco.org/ark:/48223/pf0000374802 (accessed on 10 October 2015).
6. Darvishmotevali M, Rasoolimanesh SM, Dorbeiki M. Community-based model of tourism development in a biosphere reserve context. *Tourism Review* 2024; 79(3): 525–540. https://doi.org/10.1108/TR-10-2022-0529
7. Dinis I, Simões O, Cruz C, Teodoro A. Understanding the impact of intentions in the adoption of local development practices by rural tourism hosts in Portugal. *Journal of Rural Studies* 2019; 72: 92–103. https://doi.org/10.1016/j.jrurstud.2019.10.002.
8. Wu T, Jia W, Wang Q. Deviation between willingness and actual behavior regarding community participation in protected areas: A case study in Shengjin Lake National Nature Reserve in China. Frontiers in Environmental Sciences 2023; 11: 1–15. https://doi.org/10.3389/fenvs.2023.1062147
9. Zhu Z, Wang R, Hu J, et al. Can protection motivation theory predict pro-environmental behaviour of small rural tourism enterprises? An extended model including community involvement. Asia Pacific Journal of Tourism Research 2022; 27(4): 428–442. https://doi.org/10.1080/10941665.2022.2075777
10. Huber M, Arnberger A. Factors influencing the level of local participation in planning and management of the Planned Salzburger Lungau & Kärntner Nockberge Biosphere Reserve in Austria. *Sustainability* 2021; 13(17): 9685. https://doi.org/10.3390/su13179685
11. Li W, Liu J. Investigating public support for the carbon generalise system of preference through the lens of protection motivation theory and information deficit model. *Sustainability* 2024; 16(4): 1531. https://doi.org/10.3390/su16041531
12. Zhang L, Hu Q, Zhang S, et al. Understanding Chinese Residents' waste classification from a perspective of intention-behaviour gap. *Sustainability* 2020; 12(10): 413. https://doi.org/10.3390/su12104135
13. Almeida F, Morais J. Non-formal education as a response to social problems in developing countries. *E-learning and Digital Media* 2024; 22(2): 122-138. https://doi.org/10.1177/20427530241231843
14. Gower JL, Price MF, Ruck A. The role and contribution of educational activities in UNESCO mountain biosphere reserves. *International Journal of UNESCO Biosphere Reserves* 2022; 6(1): 1–91. https://doi.org/10.25316/IR-17509
15. Yang C, Xiu Q. A bibliometric review of education for sustainable development, 1992-2022. *Sustainability* 2023; 15(14): 10823. https://doi.org/10.3390/su151410823
16. Brugger J, Hawkes KL, Bowen AM, McClaran MP. Framework for a collaborative process to increase preparation for drought on U.S. public rangelands. *Ecology and Society* 2018; 23(4): 18. https://www.jstor.org/stable/26796891
17. Oakley M, Himmelweit SM, Leinster P, et al. Protection motivation theory: A proposed theoretical extension and moving beyond rationality – The case of flooding. *Water* 2020; 12(7): 1848. https://doi.org/10.3390/w12071848
18. Havaei M, Salehi L, Akbari-Kamrani M, et al. Effect of education based on protection motivation theory on adolescents' reproductive health self-case: a randomised controlled trial. *International Journal of Adolescent Medicine and Health* 2019; 33(4): 20180195. https://doi.org/10.4103/ijnmr.ijnmr_8_22
19. Rogers RW. A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology* 1975; 91(1): 93–114. https://doi.org/10.1080/00223980.1975.9915803
20. Rogers RW. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In Cacioppo JT, Petty RE (editors). *Social Psychophysiology: A Sourcebook.* New York: Guilford; 1983. pp. 153–177.
21. Goebel K, Camargo-Borges C, Eeldrink M. Exploring participatory action research as a driver for sustainable tourism. *International Journal of Research* 2020; 22: 425–437. https://doi.org/10.1002/jtr.2346
22. Karki ST, Hubacek K. Developing a conceptual framework for the attitude-intention–behaviour links driving illegal resource extraction in Barid National Park, Nepal. *Ecological Economics* 2015; 117: 129–139. https://doi.org/10.1016/j.ecolecon.2015.06.022
23. Mayombe C. Adult learners' perception on the use of constructivist principles in teaching and learning in non-formal education centres in South Africa. *International Journal of Lifelong Education* 2020; 39(4): 402-418. https://doi.org/10.1080/02601370.2020.1796834
24. Foroudi, M, Marvi R, Cuomo MT, D'Amato A. Sustainable Development Goals in a regional context: conceptualising, measuring and managing residents' perceptions. *Regional Studies* 2025; 59(1): 2373871. https://doi.org/10.1080/00343404.2024.2373871

25. Kothe EJ, Ling M, Noth M, et al. Protection motivation theory and pro-environmental behaviour: A systematic mapping review. *Australian Journal of Psychology* 2019; 71(4): 411–432. https://doi.org/10.1111/ajpy.12271
26. Prentice-Dunn S., Rogers RW. Protection motivation theory and preventive health: Beyond the Health Belief Model. *Health Education Research* 1986; 1(3): 153–161. https://doi.org/10.1093/her/1.3.153
27. Rogers RW, Prentice-Dunn S, Gochman DS. *Protection motivation theory*. New York, NY: Plenum Press; 1997.
28. Cameron KA. A practitioner's guide to persuasion: An overview of 15 selected persuasion theories, models and frameworks. *Patient Education and Counselling* 2009; 74(3): 309–317. https://doi.org/10.1016/j.pec.2008.12.003
29. Piaget, J. 1972. *The psychology of intelligence*. London: Routledge & Paul; 1972.
30. Gumasing MJJ, Prasetyo YT, Ong AKS, Nadlifatin R. Determination of factors affecting the response efficacy of Filipinos under Typhoon Conson 2021 (Jolina): An extended protection motivation theory approach. *International Journal of Disaster Risk Reduction* 2022; 70: 102759. https://doi.org/10.1016/j.ijdrr.2021.102759
31. Eylering A, Büscher M, Funk M, Boldt J, Fiebelkorn F. Willingness of the German population to donate toward bird conservation: An application of the protection motivation theory. *Global Ecology and Conservation* 2022; 38: e02176. https://doi.org/10.1016/j.gecco.2022.e02176.
32. United Nations Educational, Scientific and Cultural Organization (UNESCO). What you need to know about education for sustainable development. Available online: https://www.unesco.org/en/education-sustainable-development/need-know#:~:text=What%20is%20education%20for%20sustainable,use%20of%20resources%2C%20and%20inequality (accessed on 10 October 2025).
33. Algurén B. How to bring about change - A literature review about education and learning activities for sustainable development. *Discourse and Communication for Sustainable Education* 2021; 12(1): 5–21. https://dx.doi.org/10.2478/dcse-2021-0002
34. Barthes A, Cibien C, Romagny B. *Biosphere reserves and sustainable development goals 1: Scientific and practical educational issues in the Mediterranean,* Volume 3. Great Britian, USA: ISTE Ltd. And Wiley & Sons; 2023.
35. United Nations Educational, Scientific and Cultural Organization (UNESCO). Framework for the Implementation of Education for Sustainable Development (ESD) Beyond 2019. Document 40 C/23. Available online: https://iau-hesd.net/sites/default/files/media_files/unesco_esd2030_framework.pdf (accessed on 10 October 2025).
36. United Nations Educational, Scientific and Cultural Organization (UNESCO). Marico Biosphere Reserve, South Africa. Available online: https://www.unesco.org/en/mab/marico (accessed on 10 October 2025).
37. Marico Biosphere Reserve. Marico Biosphere Reserve Application. 2017; Unpublished work.
38. AfriForum. Battle looms over mining application in Marico Biosphere Reserve, 2021. Available online: https://afriforum.co.za/en/battle-looms-over-mining-application-in-marico-biosphere-reserve/ (accessed on 10 October 2025).
39. Quinlan, C., Babin, B., Carr, J., Griffin, M., & Zikmund, W. *Business research methods* 2nd ed. UK: Cengage Learning; 2019.
40. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine* 2022; 292: 114523. https://doi.org/10.1016/j.socscimed.2021.114523
41. Savin-Baden M, Howell Major C. *Qualitative Research: The Essential Guide to Theory and Practice*, 2nd ed. Routledge: London and New York; 2025.
42. Creswell JW. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches,* 4th ed. California: SAGE Publications; 2014.
43. Walden GR. Editor's introduction: Focus group research. In: Walden GR (Ed.). *Focus Group Research: Volume 1.* London: SAGE Publications; 2012. pp. xxvii–Ixx.
44. Cárdenas DA, Byrd ET, Duffy LN. An exploratory study of community awareness of impacts and agreement to sustainable tourism development principles. *Tourism and Hospitality Research* 2015; 15(4): 254–266. https://doi.org/10.1177/1467358415580
45. Barukchieva EI. The relationship between tourism and the biosphere reserve status: The Danube Delta – If the Danube is "the sustainable highway" of Europe, then the Danube Delta should be the sustainable gate to the Black Sea. *International Journal of UNESCO Biosphere Reserves* 2017; 1(2): 21–55. https://doi.org/10.25316/IR-73
46. Botha E. Stakeholder perceptions of sustainability and possible behaviour in a biosphere reserve. *Sustainable Development* 2023; 31: 3843–3856. https://doi.org/10.1002/sd.2629

47. Van Cuong C, Dart P, Dudley N, et al. Building stakeholder awareness and engagement strategy to enhance biosphere reserve performance and sustainability: The case of Kien Giang, Vietnam. *Environmental Management* 2018; 62: 877–891. https://doi.org/10.1007/s00267-018-1094-6
48. Sinakou E, Donche V, Boeve-de Pauw J, et al. Designing powerful learning environments in education for sustainable development: A conceptual framework. *Sustainability* 2019; 11: 5994. https://doi.org/10.3390/su11215994
49. Schultz L, West S, Bourke AJ, et al. Learning to live with social-ecological complexity: An interpretive analysis of learning in 11 UNESCO Biosphere Reserves. *Global Environmental Change* 2018; 50: 75–87. https://doi.org/10.1016/j.gloenvcha.2018.03.001
50. Moscardo G. Sustainability education for tourists (Chapter 11). In Moscardo G., Benckendorff P (editors). *Education for sustainability in tourism: A handbook of processes, resources and strategies.* Springer: Berlin; 2015. pp. 171–184.
51. Bockarjova M, Steg L. Can protection motivation theory predict pro-environmental behaviour? Explaining the adoption of electric vehicles in The Netherlands. *Global Environmental Change* 2014; 28: 276–288. https://doi.org/10.1016/j.gloenvcha.2014.06.010
52. Janmaimool P. Application of protection motivation theory to investigate sustainable waste management behaviours. *Sustainability* 2017; 9(7): 1079. https://doi.org/10.3390/su9071079
53. Jilani G, Yang G, Siddique I. Corporate social responsibility and pro-environmental behavior of the individuals from the perspective of protection motivation theory. *Sustainability* 2021; 13(23): 1–20. https://doi.org/10.3390/su132313406
54. ATLAS.ti Scientific Software Development GmbH (Atlas.ti). Version 2024. [Computer software].
55. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology* 2006; 3: 77–101. https://doi.org/10.1191/1478088706qp063oa
56. Saunders B, Sim J, Kingstone T, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant* 2017; 52(4): 1893–1907. 10.1007/s11135-017-0574-8
57. United Nations (UN). Department of Economic and Social Affairs – Sustainable Development: The 17 goals. Available online: https://sdgs.un.org/goals (accessed on 10 October 2025).
58. Merigó JM, Mulet-Forteza C, Valencia C, Lew AA. Twenty years of Tourism Geographies: a bibliometric overview. *Tourism Geographies* 2019; 21(5): 881–910. https://doi.org/10.1080/14616688.2019.1666913
59. Rai J. Understanding poverty-environment relationship from sustainable development perspectives. *Journal of Geography, Environment and Earth Science International* 2019; 19(1): 1–19. https://doi.org/10.9734/JGEESI/2019/v19i130077
60. Schleicher J, Schaafsma M, Vira B. Will the Sustainable Development Goals address the links between poverty and the natural environment? *Current Opinion in Environmental Sustainability* 2018; 34: 43–47. https://doi.org/10.1016/j.cosust.2018.09.004
61. Cobbinah PB, Erdiaw-Kwasie MO, Amoateng P. Rethinking sustainable development within the framework of poverty and urbanisation in developing countries. *Environmental Development* 2015; 13: 18–32. https://doi.org/10.1016/j.envdev.2014.11.001
62. Thacker S, Adshead D, Fay M, et al. Infrastructure for sustainable development. *Nature Sustainability* 2019; 2: 324–331. https://doi.org/10.1038/s41893-019-0256-8
63. Chen MF. Moral extension of the protection motivation theory model to predict climate change mitigation behavioral intentions in Taiwan. *Environmental Science and Pollution Research* 2020; 27: 13714–13725. https://doi.org/10.1007/s11356-020-07963-6
64. Kapera I. Sustainable tourism development efforts by local governments in Poland. *Sustainable Cities and Society* 2018; 40: 581–588. https://doi.org/10.1016/j.scs.2018.05.001
65. Scheyvens R, Monsen JH. Tourism and poverty reduction: Issues for Small Island States. In: Saarinen Jarkko (editor). *Tourism and Sustainable Development Goals: Research on Sustainable Tourism Geographies.* Routledge: London; 2020. pp. 111–130.
66. Kanwal S, Rasheed MI, Pitafi AH, Pitafi A, Ren M. Road and transport infrastructure development and community support for tourism: The role of perceived benefits, and community satisfaction. *Tourism Management* 2020; 77: 104014. https://doi.org/10.1016/j.tourman.2019.104014
67. Hedden-Dunkhorst B, Schmitt F. Exploring the potential and contribution of UNESCO biosphere reserves for landscape governance and management in Africa. *Land* 2020; 9(237): 1–27. https://doi.org/10.3390/land9080237

68. Kanouse, D. E., & Hanson, L. (1987). Negativity in evaluations. In: Jones EE, Kanouse DE, Valins S, et al. (editors). *Attribution: Perceiving the causes of behavior.* Lawrence Erlbaum Associates, Inc; 1987. pp. 47-62.
69. Lauren N, Fielding KS, Smith L, et al. You did, so you can and you will: Self-efficacy as a mediator of spillover from easy to more difficult pro-environmental behaviour. *Journal of Environmental Psychology* 2016; 48(December): 191–199. https://doi.org/10.1016/j.jenvp.2016.10.004
70. Schwarzer R. Modeling health behaviour change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review* 2008; 57(1): 1–29. https://doi.org/10.1111/j.1464-0597.2007.00325.x
71. Brown J, Isaacs D, World Café Community. *The World Café: Shaping our futures through conversations that matter.* San Francisco, CA: Berrett-Koehler Publishers; 2005.
72. Weisbord MR, Janoff S. Future search: Finding common ground in oragizations and communities. *Systems Practice* 1996; 9: 71–84. https://doi.org/10.1007/BF02173419
73. Chen MF. Self-efficacy or collective efficacy within the cognitive theory of stress model: Which more effectively explains people's self-reported proenvironmental behavior? *Journal of Environmental Psychology* 2015; 42: 66–75. https://doi.org/10.1016/j.jenvp.2015.02.002
74. Jugert P, Greenway KH, Barth M, et al. Collective efficacy increases pro-environmental intentions through increasing self-efficacy. *Journal of Environmental Psychology* 2016; 48: 12–23. https://doi.org/10.1016/j.jenvp.2016.08.003
75. McCabe S. Theory in tourism. *Annals of Tourism Research* 2024; 104: 103721. https://doi.org/10.1016/j.annals.2023.103721