Proposed Strategy for the Development of a Local Geopark at Mui Ne Red Sand Dunes, Phan Thiet, Vietnam - based on Tourist Perceptions and Experience from Taiwan

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Abstract. Vietnam attracts many tourists owing to its unique and diverse geological landscapes. The Vietnam tourism development strategy until 2030 sets a target to make tourism a more sustainable economic sector, in which the advantages of natural resources and development of a variety of tourism products are promoted. Binh Thuan province in central-south Vietnam, hosts many high potential geosites including Mui Ne Red Dunes. Although this is a popular tourist destination, there is no clear tourism strategy for this site and local communities now regulate tourism in an unsustainable way. Online comments from review databases (TripAdvisor and Google reviews) are analysed to find themes in tourism perceptions after a visit to the Red Sand Dunes. Main themes are found that negatively affect tourist perceptions, such as the extended pollution of the dunes, theft reports and disturbance by jeeps, ATV’s and motorbikes. Many tourists recommend that this site should be better managed. To conserve this area in the future, the development of an all-inclusive local geopark is suggested, based on the tourism perceptions and previous studies assessing this landscape. This strategy is adapted from the UNESCO geopark framework and an example of a recently established local sand dune geopark in Taiwan is discussed. Implementing a local geopark, following the steps described in this study, can be beneficial for sustainable development and local communities in this area, while also promoting environmental education and enhancing disaster risk reduction.

1. Introduction

The central Vietnam coast is both known for its rapid socio-economic developments as for its attractiveness. This coastal zone hosts large numbers of tourists, is exploited by economic developments and simultaneously suffers from adverse impacts of global climate change [1]. Without adequate management strategies, valuable sites along the coastline might not be conserved in the
future. Previous studies clearly demonstrate the value and potential of the high diversity geosites in this area [2-3]. One of these sites is the Mui Ne Red Sand Dunes, in Binh Thuan province, a fascinating landscape with great potential to become a geopark, since it has unique geomorphological, ecological, and aesthetic values [4]. The current situation of community-based tourism in Binh Thuan province is still spontaneous, without a systematic tourism regulation for local communities. The awareness of the authorities at all levels and local communities in tourism development is not adequate [5]. Due to these circumstances, the environmental pressure on this landscape is increasing. Obtaining the status of geopark can promote sustainable development of the region and support other benefits [6]. This site already is a popular tourist destination among foreign and domestic tourists but is still lacking proper management. Online databases are used by tourists to rate and comment their visit to the Red Sand Dunes and these tourism perceptions are used to find themes, specific remarks, and general satisfaction rates. This study will primarily assess tourist perceptions for Mui Ne through these reviews, to explore what tourists point out as positive or negative aspects, find recurring themes in these comments and observe if there is a significant difference between reviews in Vietnamese and reviews in English. For the development of this site, possibly into a local geopark, these comments can give useful insights for future management strategies. A second objective for this study is to propose a successful strategy for the development of a local geopark with local support and discuss if this could be adapted to Mui Ne Red Sand Dunes after evaluating the potentials and issues for this location. This strategy is based on the UNESCO geopark framework, and is designed to support social, economic, and environmental benefits [7]. A recently established local Geopark (Caota Sand Dunes) in Taiwan, will serve as an example [8]. The implementation process to gain the status of a local geopark is discussed in terms of assessment and local community involvement [6].

2. Study area and methods

2.1. Study area

Mui Ne Red Sand Dunes (Doi Hong) currently covers an area of circa 37 hectares and is located on Mui Ne headland, Binh Thuan province, circa 20 km from Phan Thiet city center (Figures 1 and 2). It is an active dune field known for its rusty red color and sunset views (Figure 1). The average dune height varies between 5-10 meters [4]. The sand dunes shift from season to season and are popular amongst tourists for sand surfing, scenic hikes and driving around on quad bikes or in dune buggies. The regional climate is controlled by monsoons, and most tourists visit in the dry season (November-April) as prolonged rains often occur in the summer months from May to October. The sand dunes are mainly driven by the stronger northeastern winter monsoons winds [4].

Figure 1. Field photographs of Mui Ne Red Sand Dunes by T.-Y. Lin, July 2017.

The modern active sand dunes (generally younger than 100 years) are transverse dunes with an NNW-SSE crest orientation, and the sand appears to be derived from Mui Ne beach on the eastern coast [4].
Over time, waves transported sand onshore and once the sand is deposited on the beach, it is picked up by the wind to form sand dunes. The dunes have grown larger and steeper over time and also have the function of a buffer zone, as they can absorb the impact of storms or delay flooding to inland areas. Mui Ne is also known for other tourism destinations, such as the beaches, where recently many resorts have been built [1] the Fairy Stream (where due to erosion sand sculptures have formed along a stream) and the Mui Ne White Sand Dunes. This study will focus on the Mui Ne Red Sand Dunes specifically, and the tourism review analysis is based on tourist’s perspectives and comments after visiting this site.

![Image](image_url)

**Figure 2**- a) Location of study area in Binh Thuan province, Southern Central Vietnam b) The active red sand dune field is located within the red box at Mui Ne headland. Derived from Google Maps and Google Earth.

### 2.2. Methods

#### 2.2.1. Tourist Perceptions

To assess the tourist perceptions of visitors at the Mui Ne Red Sand Dunes, data from 2 large international review websites (TripAdvisor and Google reviews) are analysed. In these public online databases people can give a rating and/or review comment after they have visited a certain destination. Reviewers can rate up to 5 stars (1 star equals very bad experience, 5 stars equals a wonderful experience). For this study ratings without text are excluded, and although multiple languages were used in the comments, only comments in English and Vietnamese language are selected to avoid possible misinterpretation.

- TripAdvisor July 2021: total 2,037 reviews, rate 3.5 out of 5 stars. A total of 979 reviews in English language and 93 in Vietnamese language, dating back to 2011, are selected for further analysis.
- Google reviews July 2021: total 710 reviews, rate 4.1 out of 5 stars. A total of 49 reviews in English language and 125 in Vietnamese language are selected for further analysis, Google reviews only has data available over the last year.

Thus, in total 1,246 online comments are selected for further analysis. The collected comments reflect opinions of the area, and these reviews are analyzed to explore tourist feelings after visiting the Mui Ne Red Sand Dunes. The textual reviews from the databases are extracted and combined into Excel and the data are analyzed using NVivo 12 to code texts and find themes. The selected comments
are assessed one by one, to determine main repetitive themes that come forward, which are labelled to indicate patterns in the online reviews following the Reflexive thematic analysis approach [9].

2.2.2. Local Geopark Framework

Main elements that are addressed in geopark development are pointed out. The policies of tourism development for Binh Thuan province are discussed based on government reports and announcements. The establishment process of the local geopark at Caota Dunes and Taiwan is summarized, based on a review of the current framework for Taiwan Geoparks from reports and publications. The main steps and approaches concerning assessment and local community involvement that are addressed in this framework are described in a 3-step approach: in the initiation phase, establishment phase and evaluation phase.

3. Results and Discussion

3.1. Tourist perceptions

People that use TripAdvisor as a platform for their reviews in general give a lower rating compared to people using Google reviews, but for both platforms there is no significant difference between ratings in Vietnamese and in English (figure 2). Data from TripAdvisor clearly show a decline in English (international) tourism reviews since 2019, while the number of reviews in Vietnamese is increasing since 2019, suggesting more domestic visitors during the time of the global COVID pandemic. Google reviews only date back one year, the number of reviews in Vietnamese (n=126) is more than twice as large as reviews in English (n=50). Over the last year (July 2020 - July 2021) in total 245 people left a review on Google Reviews, and 67 people left a review at TripAdvisor. Although it doesn’t represent the actual visitor data (the site is unregulated and there is no data collection on actual numbers), it suggests that is an actively visited site.

![Figure 2 - Reviews on TripAdvisor of the data are on average 3.4 stars, while Google reviews users give an average rating of 4.2 stars. For Google Reviews the average rating of the reviews in Vietnamese is 4 stars, and in English 4.3 stars, while the average rating for TripAdvisor is 3.4 stars for both reviews in Vietnamese and in English.](image)

The Coded themes that were used in NVivo, are related to tourism experiences and tourism perceptions are divided in positive, negative, mixed, and neutral experiences (Figure 4). **Positive** reviews show that visitors have a better experience when visiting during the early morning or late afternoon, since during sunrise and sunset the sand turns more reddish, it’s not too hot and they can better enjoy the peaceful landscape. Visitors also highly value the landscape for taking pictures and mention that the views are beautiful. In **Negative** reviews, themes that often occurred were theft
(pickpocketing) during sand boarding activities and scams by sellers and children that try to rent out sandboards. People felt unsafe because they were being followed, or aggressively harassed by local sellers or children, and this spoiled their visit to the sand dunes. Another theme that frequently occurred in negative reviews is the pollution of the sand dunes; trash and plastic littered over the landscape troubles many people. This is often correlated to how crowded the site is, several comments point out that people go here for picnics, but leave their trash in the dunes. From the comments it seems that most garbage is found near the road and main entrance points, and if you stroll further into the dunes the landscape becomes less polluted. **Mixed** reviews mention both positive and negative feelings after visiting this area. Often people say that the landscape is beautiful, or they had an amazing experience, but there is too much garbage, it’s too crowded, or that the local people that are trying to make money out of tourists, somewhat spoil their experience here. Others mention that the site has great potential, but more investment/regulations and or management strategies are needed. Several people also wonder why the government is not paying more attention to environmental regulations of this place and suggest better enforcement and maintenance for this site. Comments classified as **Neutral** often mention that if you are already in Mui Ne, you should not miss this destination; it is interesting enough to visit, but not very special or if you have never seen sand dunes before, you should go.
Figure 4 – Main Themes - around 48% of the reviewers left positive comments, often mentioning the amazing sunsets, beautiful landscape and great scenery for taking pictures. Circa 33% of the reviews was mostly negative, pointing out the pollution of the dunes (garbage, trash, plastic), the harassment or rude behaviour of sellers and sledge renters and theft by local people and children. Circa 8% are predominantly mixed reviews and 11% of the comments was generally neutral.

Other themes correlated to activities that often occur are: ‘hot’ (n=61), which is related to visits during mid-day or late morning and early afternoon, when the sun heats up the sand and many people experience their visit as uncomfortable. Some advice not to wear flip-flops or suggest visiting when the sun is less bright. Many people include ‘sandboarding/sliding’ into their comments (n=162) and both positive and negative feelings are correlated to this experience, but most agree that it is more an activity for children, since adults can hardly go down on the plastic ‘boards’ that are provided. It is also mentioned that they use soap and wax to make the board go faster, which leads to more pollution of the environment. Another recurring theme is ‘Jeep, motorbike or ATV driving’ on the sand dunes. Only few reviewers (n=19) mention this activity and they also have mixed feelings; they either like it and think it’s a fun activity or they think it destroys the peacefulness of the landscape and find it disturbing. Frequently, a ‘Comparison to the White Sand Dunes’ is made (n=224), since many tourists visit the Red Sand Dunes as part of a tour package, also visiting the white sand dunes, Fairy Stream and Mui Ne fishing village. In these comments people mainly point out that the white sand dunes are larger, less crowded and less polluted and they are less disturbed by locals and children. But there are more ATV’s and motorbikes that drive around in the White Sand Dunes, so people also remark that as a disturbing factor when they compare it to the Red Sand Dunes. Moreover, in these comparisons it is observed that a fee is required to visit the White Sand Dunes, and the Red Sand Dunes can be visited for free.
3.2. Implications for the development of a local geopark

3.2.1. Globally accepted framework for UNESCO geoparks

The human pressure on ecosystems is growing on a global scale and a lack of awareness amongst different stakeholders and insufficient implementation of sustainable development plans will increase this pressure on the environment. This is where geoparks can step in, for touristic areas with a high geoheritage value, such as Mui Ne Red Sand Dunes. Conservation of and education about the area can help increase awareness and simultaneously conserve a precious environment. A geopark is defined as a site of particular geological importance, which is being sustainably managed to conserve the geoheritage and promote public awareness mainly through tourism [10]. According to a globally accepted framework by UNESCO, geoparks are not solely focussed on geological importance, but are also of value to ecological and cultural aspects and socio-economic development of the surrounding region [11,7,3]. The balance between these different elements, for instance between tourism and environmental conservation, should be considered for each specific area (figure 5). According to this framework, the establishment of a Geopark should be founded on strong community support and local involvement through “bottom-up” processes [11-12]. Fitting management strategies ought to be proposed in consultation with the involved stakeholders and strong support of the (local) government is needed for the provision of necessary financial resources and to make agreements on socio-economic development and conservation strategies [12].

![Diagram](image)

**Figure 5** – Main elements considered in the geopark development process, demonstrating the synergy between heritage conservation, economic development, and community participation, adapted from [12]

3.2.2 Policies for tourism development in Binh Thuan

In 2020, Binh Thuan province issued an implementation plan for a tourism development strategy till 2030, which set the task of developing a plan for the Mui Ne National Tourist Area, promote community-based tourism and create sustainable livelihoods for local people [13]. Therefore, it is fitting to propose a strategy for the development of a Geopark at Mui Ne Red Sand Dunes, to support local communities and manage tourism in a sustainable way. To safeguard cultural and environmental values and to avoid fragmented tourism approaches, the development of a Geopark needs to follow a well-structured plan with cooperation of both the government and local communities. Currently there is still no separate policy for the Mui Ne national tourist area and management is overlapping; the responsibilities between the management unit and the Management Board of Ham Tien, Mui Ne tourist area and Mui Ne ward are unclear. This leads to limitations in management strategies,
maintenance and enforcements in tourist sites of Mui Ne lead to corresponding issues such as environmental sanitation is not guaranteed, there are many traffic jams, the sites are overcrowded during holidays, monotonous products are being sold and there is a lack of attractive services for tourists [14]. Therefore, it is essential to have policies to enhance environmental protection, manage tourism, and develop specific products and attractions in line with the unique culture here [13]. Currently, Binh Thuan is implementing an investment project to build Phan Thiet airport, with operational activities for international flights, thereby contributing to strongly promoting socio-economic development of the region and projects to improve infrastructure throughout the province are implemented to further meet the tourism goals.

3.2.3 Example of implementation - local sand dunes geopark in Taiwan

In Taiwan, the TGN (Taiwan Geoparks Network) follows the global UNESCO geopark objectives, and highly prioritizes the participation of local communities by stimulating bottom-up approaches [6]. The Taiwan Geoparks Network developed core values that each geopark in Taiwan needs to fulfill (Figure 6). Because of these values, geoparks can contribute to promoting environmental education, maintain environmentally responsible tourism and stimulate local community involvement.

![Figure 6 - The four core values for Geoparks in Taiwan](image)

Before bringing a site forward as potential geopark, it is important to gain more knowledge on the system dynamics, human activities, development plans, environmental degradation status and underlying issues [15]. In the case of Mui Ne Red Sand Dunes, most visible environmental issues relate to the rapid development of tourism industries and lack of environmental awareness and regulations for the dune landscape. Main themes found from the review assessment concern waste pollution, the use of plastic boards that are waxed with soap to slide down the dunes or ATV’s and jeeps that destroy the peacefulness and leave an environmental footprint. Furthermore, the sand dunes are very dynamic and an issue for local communities in the surrounding area is sand invasion; due to strong winds and flying sand, the sand is invading nearby villages and farmlands, making the land less fertile [16]. This sand invasion is caused by a combination of human factors and natural processes and has local authorities and communities worried. Embankments are built and trees are planted to limit the sand mobility. Improvements in this current situation are needed to work towards a sustainable environment and maintain the characteristic features of the landscape. Local residents are already very
much involved in tourism at the Red Sand Dunes, and play a large role in how tourists experience their visit. Therefore, when developing this area into a geopark it is essential to involve local communities in the development plans. Moreover, from an educational perspective, when people are more involved in planning and when public understanding of the environment and dune dynamics is enhanced, they might take more responsibility for the sustainable use of natural resources [17-18]. A newly established local geopark in Taiwan, Caota Sand Dune geopark, conserves the most complete coastal sand dune system in Taiwan [8]. Three general steps were followed to establish this local geopark, the main points are summarized below [19].

- **Initial phase:** This phase starts with an environmental assessment of the area, by listing the values and key points the geopark can promote [2]. A list of involved stakeholders is drawn up, to visualize the network of people related to the geopark site. In this stage, ways to gain support from local communities are inventoried and local communities are involved in the development plans, can observe their local environments and form a network with other geopark communities, on a national or international level, with Global Geopark Network or UNESCO. Through these networks, stakeholders can learn from each other and share experiences [20]. For Caota Dune Geopark, the dune vulnerability is assessed and environmental issues are examined and geological and ecological features are described to form a narrative for educational purposes.

- **Establishment:** This can be done on a local, national or international level. In this phase, coordination with local and/or national governments that are in charge of the tourism development in this area is needed, for arranging funding and drawing up development plans. For example, in Taiwan the local and central government will need to provide a budget for managing geoparks by law, to play a part in the country’s sustainable development. In Caota Dunes geopark, bottom-up approaches from within local communities are stimulated and guidelines are drawn for environmental protection in line with the local geopark's core values, protecting the unique dune habitat [21]. Roles which might be fitting for local residents are tour guiding, host activities in the dunes, environmental education, help in conserving and monitoring the landscape or promotion of local goods, for example through geo-products and businesses. Upon assessment of the dune vulnerability, vulnerable zones can be selected where no tourists are allowed, to not disturb natural processes. At Mui Ne, certain areas could be targeted to manage the issue of flying sand, in cooperation with local residents. Construction of designated walking routes, signs, an information centre etc. can all be considered when developing the dune field as a geopark.

- **Evaluation:** This phase entails regular monitoring activities, carried out by scientists or involved stakeholders. To maintain the geopark status regular network meetings should be held on a national and international level, to evaluate maintenance, tourism pressure, observed environmental vulnerability, role of local communities, etc. In the case of Caota Sand Dunes, (local) volunteers are trained to monitor the dune dynamics, but this could also be carried out by local geopark managers. It is important to check if the core values of the geopark are met, by analysing observed benefits for local community, geomorphology and biodiversity. Thus,
in order to maintain the Geopark, its performance and core values, long-term planning, continuous maintenance and regular evaluation are essential factors [6].

Many elements are open for consideration in these steps and the development plans should fit the local needs and expectations. However, it is essential to all geoparks to stimulate the balanced relationship between humans and the environment.

4. Discussion and further research

4.1. Discussion
Binh Thuan province wants to develop policies to support people to participate in the development of community-based tourism, to improve economic and cultural life and contribute to poverty alleviation for the communities. To work towards these goals, this study suggests developing a local geopark at Mui Ne Red Dunes, with strong local community involvement. This might later be developed in a larger or even UNESCO geopark, together with other geosites at Mui Ne, like the Fairy Stream, White Sand Dunes and Mui Ne fishing village. All combined these geological features are characteristic for this region and its geological history, and many local tour operators already offer a package visiting these 4 sites.

For Mui Ne Red Dunes, many reviewers commented on the large amount of garbage in the sand dunes, stating that this pollution had a very negative impact on their visit. Tourist activities could be managed in a better way to reduce the impact on the environment, by stimulating both visitors and local communities to help keep the dunes clean, through environmental education or providing a fund for clean-up actions. Another element that can be considered for this site is a small entrance fee; this can provide a budget for environmental conservation and provide jobs for local residents in for example monitoring the environment, dune dynamics or visitor numbers. A main objective of a geopark is local community involvement and stimulating the local economy. The local economy can be developed through the sale of products such as food or souvenirs, tourism jobs or jobs related to geopark maintenance and monitoring. Moreover, selling local products can help in promoting the culture and local identity to create a better understanding of the history of the community in the surrounding area. It is hoped that by stimulating the local economy, children that now work at this site for extra income can go to school instead, since another main theme in the tourist reviews was theft and harassment by local children. Additionally, most tourists advise to go here in the early morning or late afternoon, because during the day it is often too hot. Future monitoring can be tailored to this, as these are peak times where it can get very busy.

Current tourism activities in the Red Sand Dunes are sandboarding and ATV/ Jeep driving on the dunes. This is controlled by local tour operators and local residents and children, and because of a lack of management rules or environmental regulations, there is no supervision of these activities. These activities damage the sand dunes and can be a threat for the local environment if they are not being monitored. Future management strategies should address these activities to become less of a burden on the environment. Another matter related to the high dynamics of the sand dunes, is desertification of farmlands and villages around the active dune field. In collaboration with local stakeholders, solutions for this issue need to be discussed in terms of the future boundaries of the geopark and management strategies of farmlands surrounding this geosite.

4.2. Limitations and further research
While this study has been conducted very carefully, there are some potential limitations. During the assessment of the reviews, it seemed that not all people understood the rating system; some comments were very positive but only rated 1 star, whilst sometimes very negative reviews were found at a rating of 5 stars. Overall, this was encountered on very few occasions. Additionally, the nationality of reviewers in many cases is unknown, and it is possible that Vietnamese tourists have left comments in English. The general assumption throughout this study has been that English reviews are from international tourists and Vietnamese reviews are from domestic tourists, however no conclusions are made based on this assumption. Lastly, reviews and perceptions can be very personal and people that have already visited many sand dunes or deserts before seeming to be less impressed or give more negative reviews. Nevertheless, the objective of this study was to address main themes that are pointed out in these comments to improve the tourism experience in the future. This study identified main themes related to tourism experiences in the Mui Ne Red Dunes from English and Vietnamese reviews, but further studies can also identify these themes in the remaining reviews in other languages, to gain a broader understanding of the perceptions, or specifically identify themes for tourists from different backgrounds for future information provision.

To develop the Mui Ne Red Sand Dunes into a local geopark, more research is needed on local perceptions and involvement, to stimulate community-driven research. Additionally, the perceptions of the different stakeholders that are involved in this site (e.g., tour operators, policymakers, local government officials, etc.) can be assessed. This data collection can be helpful considering long-term management strategies. Furthermore, to gain a better understanding of the local environmental dynamics, research could focus on biodiversity assessment in the dune ecosystem and on conservation management approaches. Regular monitoring of the system dynamics is required, as dunes are highly dynamic but also vulnerable environments that can quickly change and are sensitive to human impacts.

5. Conclusion

Environmental issues in Mui Ne Red Dunes are pointed out in the tourist reviews, such as waste pollution and destruction of the natural landscape. Other issues that came up were theft and harassment, all having a negative impact on this site. Therefore, future management strategies should address these issues for the sustainable development of this location and find alternative ways to gain profit for the local community. Therefore, when nominating this area as a geopark site, impacts on the natural environment should be evaluated and clear communication with local residents is needed to find an increased social acceptability and local input for future development of the geopark. Implementing a local geopark following the steps described in this study can be beneficial for sustainable development and local communities in this area, and when successful, it can be promoted to develop into a national or even globally recognised UNESCO geopark, including nearby geosites as well. The number of reviews and positive comments point out that Mui Ne Red Sand Dunes is a promising area and attracts many tourists on a yearly basis. By developing this site as a geopark, it can be protected and conserved to ensure that natural resources will be well-maintained and that future generations can also enjoy this remarkable landscape.

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