Characterization of self-guided trails on the Xihuingo Volcano, state of Hidalgo (Mexico)

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ABSTRACT

Objective: hiking allows us to appreciate nature; it is also an environmental education tool, causing social changes which can be directed towards behaviors and decisions in favor of environmental protection. The objective of this study was to generate the necessary information in order to hike the trails of the Xihuingo Volcano (state of Hidalgo, Mexico), self-guided and with safety.

Design/Methodology/Approach: the methodology consisted of monitoring the guidelines established for the preparation of the Topographic guide, as well as those considered in the Excursion information method (MIDE) and the processing of tracks with global positioning system (GPS) receivers, using a geographic information system as interface.

Results: data on local history, culture and biodiversity were obtained. As well as descriptions, time estimates, and profiles of the routes; with the identification of places of interest in maps; and digital files to be used in GPS receivers.

Limitations of the study/Implications: the limitations in the data are related to the precision margin of the GPS receivers during the recording of the information (±3 m). As well as the number of records on biodiversity at the time of consultation.

Findings/Conclusions: data obtained highlight the wide biological diversity located at the site, with important representation of endemic and native species, some of them in status of ecological risk. These species can be the basis for the creation of a tourism project for the benefit of the local people. Such a program would face the ecological problems derived from mining, illegal logging, and grazing observed in the area, as a strategy for the conservation of the natural environment.

Keywords: conservation, nature, hiking.

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INTRODUCTION

Hiking is a sporting activity that consists of walks following an itinerary (Real Academia Española, 2019); it allows people to open their mind and get in tune with nature (Secretaría de Turismo, 2004a). Whereas a trail is a small path that allows easily to walk covering a given area (Secretaría de Economía, 2014). A trail is considered as self-guided when it is possible for visitors to make the tour using brochures, symbols or other signaling materials

(SECTUR, 2004b). In sum, a topoguide is a document that describes one or several trails (Maza, 2002).

The Excursion information method –MIDE is a system to assess and express the technical and physical demands of the routes (París, 2002). The information regarding trails is analyzed and presented by various authors and institutions with an approach focused on the MIDE (Arqueofuer, 2011; Consorcio Camino del Cid, 2019). Which includes elements of the topographic guide (SECTUR, 2004a, 2004b) or else, it is focused on an international classification of high mountain trails (Neyra, 2012).

However, in general, a standardized methodology has not been defined for obtaining and processing the data necessary for the comprehensive description of the middle and low mountain trails within the national context. Thus, this study constitutes an opportunity to explore such a possibility. The objective was to generate the necessary information in order to hike the trails of the Xihuingo Volcano (estado de Hidalgo, Mexico), self-guided and with safety.

MATERIALS AND METHODS

The general description was made based on bibliographic and cartographic information, and direct observations on the site. The elevation profiles of the trails were generated with the Profile Tool, in Quantum GIS. The biological information was obtained by consulting the files of the National Biodiversity Information System of the National Commission for the Knowledge and Use of Biodiversity (CONABIO, 2018). Those files were correspondent to different biological groups and their registered locations within the buffer areas of the volcano.

The information about MIDE (París, 2002) was obtained from the data associated with each track consulted in Google Earth Pro, and the physical characteristics observed in each trail. The tracks of the routes were recorded with a Garmin™ Map64s GPS receiver and were rectified with Google Earth Pro, following the recommendations of the Spanish Federation of Mountain and Climbing Sports (2018), which were later used to prepare the map. From the review of different documents that deal with signaling issues (SECTUR 2004b, 2004c; FEDME, 2018; Tacón and Firmani, 2004), a series of elements is proposed for implementation at a local scale.

RESULTS AND DISCUSSION

General information

The general description (history, climate, services, etc.) and the map coincided with the way in which other authors present them (SECTUR, 2004a, 2004b; Arqueofuer, 2011; Neyra, 2012; Consorcio Camino del Cid, 2019). These data offer a site overview.

Profile and routes of the tours

The profile shows the distance traveled and the altitude, locating sites of interest during the journey (Figure 1). They coincide with the way in which other authors present them (SECTUR, 2004a; Arqueofuer, 2011; Neyra, 2012; Senderos GR, 2015; Consorcio Camino del Cid, 2019; Cabildo La Palma, 2021). The profile shows upwards disposition,

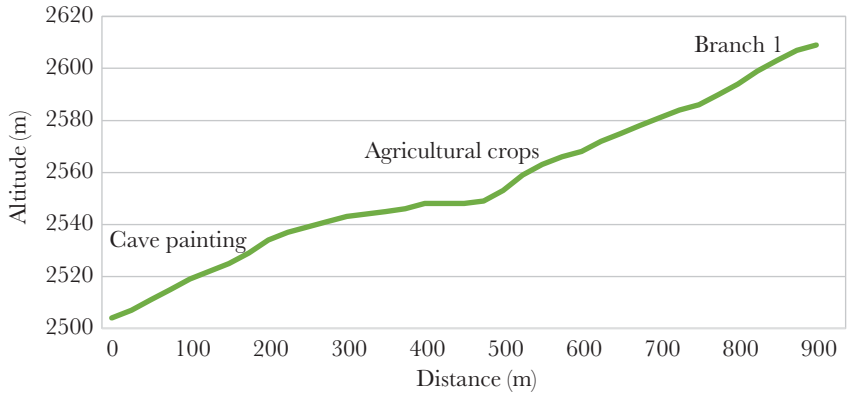

Figure 1. Elevation profile of the "Sendero Microsmos" (one trail). Elaborated by the authors, based on Maza (2002).

towards the summit of the Xihuingo volcano. In addition, 4 tracks were obtained in GPX and KMZ formats. Only in the case of Senderos GR (2015) there are other files of those types.

Biological information

In total, 484 species were found (CONABIO, 2018), of which 78 are considered to have some status of ecological risk (Secretaría de Medio Ambiente y Recursos Naturales, 2019; International Union for Conservation of Nature 2020; Convention on International Trade in Species Threatened Wild Fauna and Flora, 2020). Biodiversity information was found only in two publications (Arqueofuer, 2011; Neyra, 2012).

Excursion Information Method –MIDE

The travel times of the four trails range from 20 min to 2 h 50 min, Trails are of the crossing type, and intermediate level, in terms of environmental severity (Table 1). Some authors use this method to assess trails (Arqueofuer, 2011; Consorcio Camino del Cid, 2019). While SECTUR (Mexico) (2004a) considered only some of these data, and Neyra (2012) opted for an international classification for high mountain trails.

Table 1. Descriptive and quality traits of the trail "Sendero Microcosmos" according to the Excursions Information Method –MIDE.

Microcosmos.			
MIDE		**13-061-0086-R(C) Microcosmos**	
Schedule	30 min	2	Severity of the natural environment
Ascent slope	123 m	3	Guidance on the itinerary
Descent slope	18 m	2	Difficulty in movement
Horizontal distance	924 m	1	Amount of effort
Type of tour	crossing		

Graduation from 1 (easy/minimum) to 5 (difficult/maximum).
Own elaboration based on MIDE (2002).

The qualification scale goes from 1 (easy/minimum) to 5 (complex/maximum). Elaborated by the authors, based on París (2002).

CONCLUSIONS

It is possible to apply the established guidelines for the elaboration of a Topographic guide, based on the Excursion Information Method and the processing of tracks for self-guided hiking along the trails on the Xihuingo Volcano.

The information and infrastructure associated with the trails can contribute to a safe, effective route with low environmental impact. Also, they can be the basis for the integration of a tourism project based on hiking, which can be replicated in other contexts. The conservation of the natural environment is important due to the number of native and endemic species, some of them present with status of ecological risk. Other conservation factors are representativeness at the state scale, diversity of types of vegetation and the environmental services provided. In addition to the metaphorical and spiritual meaning that the volcano site has represented over time since its discovery.

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