

# **A METHODOLOGY FOR THE INVENTORY AND ASSESSMENT OF TRAILS IN NATURAL AREAS APPLIED TO THE MARTIAL GLACIER SITE, USHUAIA, ARGENTINA**

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## **1. DEVELOPMENT OF A METHODOLOGY FOR THE ACCOUNT OF TOURIST ASSETS ALONG TRAILS IN NATURAL AREAS**

A methodology for the account of tourist assets along trails allows inventorying a series of components and aspects of the landscape to make clear the process and models for space planning. This methodology is called Re.Je.Sen. (this abbreviation accounts for its Spanish name) and in this paper it is particularly applied to a mountainous area in the south of Tierra del Fuego, Argentina.

A new version of the methodology by Borla (1995; 1998; 1999) modified by Salemme *et. al.*, 1999 was designed to the account of tourist assets along trails. It takes a transect —the trail or path— considering all the components which can be reachable by the observer's view, understanding the scenery as a whole. The transect is divided into smaller units —sectors— allowing a smaller-scale analysis. The division is based on a set of indicators —geographical, biological, cultural—. Each split is marked by a node, a set of fixed points along the trail where the hiker makes a stop because of different reasons: a panoramic viewpoint, a peculiar non-mobile component, a spot where he meets other hikers, inspires a stop for a rest or a snack. Each sector is described in a filecard including the following items: Sector, Filecard number, Conservation degree, Use degree, Use Impact, Panoramic viewpoints, Facilities, Seasonal accessibility, Communications, Length and slope, Estimated walking time, Components review (Abiotic components: a maximum of ten; Biotic components: a maximum of forty; Anthropic components: a maximum of five), Any further information, Topographic profile.

## 2. SELECTION OF INDICATORS FOR HIERARCHY

Once inventory stage is fulfilled, each component is assessed through a set of weighed indicators (subjective and objective) with numeric values previously assigned, designed for each component type. Besides, in this stage the biotic components were divided in floristic and faunistic. After assessing each component by each indicator and corresponding weighing, where hikers' preferences are taken into account through surveys<sup>1</sup>, a numeric value is obtained (score) that reflects the hierarchy of that component and allows its comparison with other components belonging to the same group. Scores keep a scale that ranges between 0 and 4 and up to 2 decimals are considered. The higher the value, the higher the hierarchy of the component.

### 2.1 Sectors

In order to give hierarchy to the sectors, several points of view that cover a varied analysis spectrum are considered. On the one hand, a series of indicators try to group those characteristics that due to their quality and quantity will give each sector a determined hierarchy, for example, chromatic diversity, wind exposure and panoramic viewpoints. On the other hand, the total amount of abiotic components in the sector is taken, they are summed up (this will give an idea of the landscape structure diversity) and the obtained numeric value for the abiotic component with the highest score in the sector is added. The same procedure is carried out for the biotic and anthropic components. This calculation will give a value that reflects: (i) diversity of abiotic components, (ii) diversity of biotic components, and (iii) gives the chance to identify the component with the maximum hierarchy in a sector. These scores vary between 1 and 10. The highest final value for each sector —adding the maximum hierarchy component score— will be reflecting a higher diversity of components in the sector. Finally, the data from the inventory filecard is taken, such as the existence of historic sites or symbolic representations, facilities, and negative values are given to impact use and grade indicators. Also, the situation of land ownership is considered, where it is stated if the sector is located within a natural protected area<sup>2</sup>.

Each of these values is then multiplied by the weighed corresponding factor and their addition gives as a result the final value that corresponds to the sector hierarchy.

This final value, that varies from 1 to 10, demonstrates in which conditions each sector is, being important for the planning and re-tracing of the most deteriorated sectors, improvement of facilities and also to promote an optimal use in the sectors with the highest scores.

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1 In a previous study (Vereda *et. al.*, 2010b) a survey was carried out in order to know the preferences of hikers in natural areas in Tierra del Fuego.

2 In the study that was already mentioned (Vereda *et. al.*, 2010b) 55% of hikers who were interviewed expressed that they preferred to go hiking in protected areas because they considered that those trails would be better kept, would be more pristine, quieter and safer.

## 2.2. Trails

The trail can be considered as more or less attractive according to the final value obtained by the media of the values gotten for its sectors. In this respect, a trail which has most of its sectors with a high score will be considered more valuable (and therefore, it will raise more interest) than other which the mean value of its sectors is inferior. To this mean value of sectors a point for each plant community different from the one in the first sector of the trail is added. For example, for the study case where the trails begins in an area with forest, then it goes up through Andean cushion-heath and finishes in the Andean desert, two points should be added to the mean value of sectors.

The final assessment allows to categorize trails in three different groups:

Category I: Trails which final value is higher than 8 points.

Category II: Trails which final value is between 6 and 8 points.

Category III: Trails which final value is inferior to 6 points.

These results contribute with rational data for decision making as regards possible seasonal closing of trails, encouragement to use other trails, opening of new trails, devote efforts to keep those trails in better conditions, etc. In the end, trails can be assessed through a system of indicators whose values will depend on each environment and on the conditions trails are at a given moment for hikers who are respectful of wilderness.

## 3. METHODOLOGY APPLIED TO THE MARTIAL GLACIAR AREA.

The Martial Glaciar area is located 7 km from Ushuaia, being quite close to the city centre. It allows the visit to a mountain area with different components which are interesting for tourism, taking into account that Tierra del Fuego is a tourist destination based on its natural landscape. Different activities are held in the surroundings, especially along the access road (hotels, restaurants, lodges). Besides, in 1990, it became a natural reserve (although it is not included at present in the list because it was named before Tierra del Fuego had its own legislation on protected areas in 1995). Particularly, the Martial basin is at the top of the mountain, being one of the fresh water sources for the town, so the Provincial Sanitary Services Direction gives guidelines in the area as well as the Provincial Tourism Board that is in charge of tourist and recreational activities held in the area.

This place offers important possibilities for hiking; specifically, for this study, the trail that has been taken into account starts at the beginning of the Louis Martial Road and finishes at the Martial Glacier base. The study place was divided into 4 sectors, according to the sketch (figure 1), whose characterization is given below. Also, a complete filecard for a sector is presented as an example (see table 4).

Sector I: from the starting point to the beginning of the chairlift. The trails goes through a mixed forest of high deciduous beech (*Nothofagus pumilio*) and evergreen beech (*N. betuloides*).

Sector II: the trails runs next to the chairlift, from its beginning to its end where high deciduous forest (*Nothofagus pumilio*) is found.

Sector III: from the end of the chairlift to the timberline, the trail runs through Andean cushion-heath.

Sector IV: from the timberline to the base of Martial Glacier, occurrence of Andean desert.

After the application of the assessment methodology, sectors 1 and 2 show in their scores less diversity of abiotic components, being more important the values related to anthropic components. Sector 3 gets high values since it is the place where the Andean cushion-heath occurs, it has chromatic diversity, it is not too exposed to wind action, it has diversity of abiotic, biotic and anthropic components, although the occurrence of exposed roots takes away value in the use impact item. Sector 4 gets high scores due to panoramic viewpoints, abiotic and biotic components, despite its high wind exposure. In sum, the maximum score for sectors 3 and 4 is showing that most of indicators (except for use impact in sector 3 and wind exposure in sector 4) keep high scores. The mean of the final value of sectors for this trail is 6 (quotient  $23,84 / 4$ ). In order to reflect the diversity of environments, the trail runs through three different environments (forest, Andean cushion-heath and Andean desert), resulting in 2 additional points. Therefore, the final value for the Martial trail is 8 points, corresponding to Category I.

#### 4. CONCLUSIONS

The value assigned to landscapes occupies a more important place in the organization of tourist activities in natural areas, where visitors show a quest for active participation in the natural environment. In this respect, hiking activities develop a special role that leads to a particular bond between human being and landscape.

The study of landscapes allows planners to be aware of the different components which are part of natural areas, as well as the relationships that are present in the area and the natural and social organization that characterize the whole. Besides, through the symbolic contents of a landscape a person can get closer to its meanings, which are somehow, «hidden» or «specially visible». This represents a support to define which structural components of the landscape, flora and fauna species, historical-anthropological values, are the most representative for each trail. Taken this specific knowledge, hiking proposals with different thematic content can be designed.

The methodology proposed here allows building up inventories and setting up a hierarchy of landscape components in an analysis scale that can be adapted to each case in particular. The assessment of trails potential use is a tool of importance in decision making for tourism planning. Besides, it gives basic information to be used in cartography, brochures, field guidebooks, etc. It may also be used to re-trace a sector of a trail or to assess the potential use of a future trail, minimizing environmental as well as hikers' risks, optimizing available resources. This methodology is designed as to be enlarged, adding new indicators or new levels in each case, for components as well as for sectors, resulting on a versatile methodology that allows the integration of different indicators that may come up from field monitoring.