

# HOW TO MEASURE THE *URBAN SPRAWL* PHENOMENON THROUGH LANDSCAPE INDICATORS: AN APPLICATION TO THE ISLAND OF TENERIFE

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## I. PROBLEM DEFINITION. HYPOTHESIS

I firmly believe that the greatest landscape concerns that currently exist on the island of Tenerife are the uncontrolled periurban construction and the treatment of contiguous unconsolidated space. These aggravate the complexity of regulating and distributing the space occupied by the cultural landscape components. It can be hypothetically estimated that the cultural space (33%), when compared with abiotic (8%) and biotic spaces (59%), is the most fragile landscape at the moment and, therefore, the one that requires the greatest concern, attention, information and investment. These reasons allow me to explain, at least in the initial phase, this model.

## II. PROBLEM JUSTIFICATION

My intention in this paper is to apply some indicators that will allow me to introduce, in an exploratory and general manner, new ways of defining construction dispersion models in the periurban land, in this case, using the island of Tenerife as a reference framework.

The phenomenon technically denominated *urban sprawl* or *suburban sprawl* (O'Meara, 2004, Jaeger, 2010, Muñiz and García-López, 2007) is characterized by areas consisting of low-density, unstructured and amorphous constructions that create problems linked to increased temporal and spatial distances from the family residence to the different target centres (employment, education, entertainment, etc.). This entails, among other things, the dependence on private vehicles, the generation of exclusion spaces (Smith, García and Mejías, 2007), and the high cost of management and maintenance of infrastructure and services.

### III. METHOD

In order to define the analysis reference unit, two different scales will be used: the first scale is the insular dimension (Tenerife), which must be understood as a maximum reference frame; the second scale must be interpreted as a minimum unit of reference, in this case, the cadastral area defined by the cadastral register of rustic land in 1956.

The insular scale (macro-region) allows me to assess the richness, formal structure and distribution of different types of construction. For this, landscape indicators are used to measure heterogeneity, irregularity, wealth and distribution. These indicators have been used by the *CORINE Land Cover* methodology oriented to landscapes, and will allow me here to compare the characteristics of the constructed dispersion on the island of Tenerife in relation to other regions, mainly island regions.

At the local scale (micro-region), I analyze the detailed changing process from social community space to urban land, upon its conversion first into agricultural rural land, and later on into «industrial» agricultural rural land. For this, I use a time sequence that goes from 1956 to 1991.

### IV. INSULAR SCALE

To analyse the insular scale, I will focus on two components: the road communication network and particularly the constructed space.

#### 1. The road network. Structuring component of the territorial dispersion model

Overall, the island of Tenerife concentrated a road structure of 10,200 kilometres in 2009. With an insular area of 2,032 km<sup>2</sup>, this allows a density of 5 km/km<sup>2</sup>. If we relate the area of the road infrastructure development between the different landscape environments (abiotic, biotic and cultural), the result clearly indicates the weight that it has in the cultural environment, when compared with the others.

#### 2. Relationship between the road network and the landscape categories

At the insular scale, the road system has a total length of 10,228 km. From these, 75% are urban roads. Its cumulative total occupancy is 23 km<sup>2</sup>. But the road distribution is uneven and depends on the landscape environment that it structures.

When paying attention to the landscape category that has the greatest connection with the road network, we prove both its internal distribution and its contiguity relationship through the inter-road polygons.

#### 3. The settlement. Component responsible for the geographical dispersion

The distribution of the settlement is portrayed in two key time points (1964 and 2002) in the territorial development of the island. The year 1964 can be considered as the moment

when the economic, social and territorial model changed due to the fundamental role played by the tourism industry.

#### **4. Data model for the metric analysis of constructed area on the island of Tenerife**

Following the *Land Cover*, several indicators are used to measure the peculiarity of the landscape. Hence, richness, diversity, level of heterogeneity or homogeneity, regularity or irregularity, and the dispersion of all components that characterize a particular landscape are measurements that allow the comparison with other units of reference (Gallego, Escribano & Christensen, 2000).

The aim of this study is not to consider the set of components that characterize the landscape, but to be able to explore one of the elements in all its complexity in order to establish its own pattern of behaviour and its clear influence in changing the general landscape structure of the reference unit. The constructed area is an element that belongs to the cultural fabric of the landscape. However, its recent development exerts a very important force of resistance in the development of the flows and rhythms of the other patches that characterize the landscape on the island of Tenerife.

#### **5. As a result**

1. The behaviour seen between 1964 and 2002 demonstrates the growth in dispersion, especially in the periurban and rustic areas.
2. The constructed land component occupies 22% of the total cultural space. It is twice the area covered by export agriculture (9%) and a third of the area occupied by the rest of the agricultural productive space (64%).
3. The eclectic nature of the economic development model has helped build high density urbanised spaces in the periurban and rural areas. These results depart from the traditional model of concentration and maximum efficiency of usable space that is represented by the traditional rural settlements, which in this case are on the opposite side.
4. Traditional rural settlement patterns are similar to urban areas, playing a role in reorganising and integrating dispersed pieces of their environment.
5. In short, from the standpoint of landscape, richness, heterogeneity, irregularity and dispersion are values that enhance the landscape of a region. In the present case, the constructed area restricts this pattern. If we consider as a reference the traditional organization system of the territory, which could be represented by the traditional rural settlements, we found that using the different indicators, all the classes of this component are far from the traditional model.

#### **V. THE LOCAL SCALE SOCIAL SPACE EVOLUTION: THE CULTURAL LANDSCAPE AS A PROJECT**

Metastasis (García & Gutiérrez, 2007) exists, but how does it start? The interlocking and mystery of relationships that explain the different places (Maderuelo, 2006) are fundamental

to understanding the behaviour of the regions. Social space carved throughout history determines undoubtedly the richness of landscapes. This space is always under construction. His channelling in one direction or another depends on the territorial development model chosen. Knowing its landscape foundation is the key for determining its development, distinct, heterogeneous, authentic and identity model (Vera, 2008, Mejías, 2008). The concept of *cultural landscape* sets and directs the footprint produced by the work carried out over the territory (Sabaté, 2007). Its structural patterns and behavioural rules will guide which should be its projection, always articulated in the various instruments of territorial distribution.

## VI. CONCLUSIONS

1. *Urban sprawling* can be measured through various reference systems and scales. In this article, I propose an analysis based on two units: a complex and large unit such as an island; and another complex and specific unit such as a cadastral area.
2. Urban sprawling on the island of Tenerife is manifested through the expansion of the construction in the periurban and rural areas, being both half of the island constructed area. The urban fabric tends to silt up the gaps generated by dispersion. This same tendency forces the consolidation of the dispersion in rural settlements.