Visual Quality Condition: (VQC)

This visual quality model is based on the mixing and implementation of tested analytical procedure (e.g. Brouwer, 1996) by means of (i) the common-value and basic elements of the perceptive theories; (ii) the results of statistical models reported in the literature (LCJ, SBE, CE, etc.). These models try to describe the visual quality of a site with the (statistical) rationalization of several subjective judgments of the site users. The VQC model implemented does not use single statistical functions described in the literature but selects the most significant function descriptors, and use them as operative and elementary criteria/descriptors. Every operative criterion/descriptor can be built up by elementary criteria/descriptors; and each of them is subjectively described by one value. This step allows to make objective the judgment of a picture perception by means of 1) its breaking down into common-value elements, 2) their analytical building up. Every criterion/descriptor assumes 1 (worst case) to 5(best case) value. The weighted mean of operative criteria/descriptors of one picture gives a synthetic and geocoded value of aesthetic appreciation or refuse, which can be processed with other similar values. The aim is not to obtain absolute landscape visual values, but to support the design process with some objective estimations of this design element. All geocoded values are normalized in one index that has the same variation range of other indices.

Visual Field: VF (s-h)

This index estimates the general visual field limitation by the existing or designed plantations. A radius of 50 meters not interested by vegetation is considered an unlimited visual field. This threshold has been chosen because above it the quality of the visual perceptions of trees plantation drops. A 50% decrease of the visual field means no significant influence of plantation, more than 75% of VF reduction shows probably a excessive limitation. Intermediate values of VF point out the variability of the perspective and the scenes. VF gives different information if calculated starting from buildings, rural roads or highways, depending on the more or less urbanised landscape considered.

Diversity - Heterogeneity (H)

It comes from a deeply tested index (Shannon index) even in classic or landscape ecology. In this case It gives information about heterogeneity of patches and/or fragmentation of vegetative systems' network. In the lconsidered landscapes and at the considered spatial scales a progressive reduction of diversity generally brings to negative consequences. In the DSS the index variation is reported on a 0-100 scale.

Margin effect (MARG)

Ecotones are transition ecotopes, and are characterized by an higher diversity and functionality. Among the existing shape indices (all of them presenting interpretative problems) has been chosen Patton index, for computing and clearness reasons.

Connectivity (CON)

It is utilized in to estimate the functional exchange quality in a landscape on the basis of the corridor network. It is supposed to be empirically correlated to several positive ecosystem functions (biotic richness, metapopulation survival rate, nutrient loading control, etc.) and has no a clear ecological meaning.

Circuitry (CIR)

This index is utilized in the literature like connectivity to estimate functional exchange quality in a landscape on the basis of the corridors network (described in terms of nodes and links), and it is supposed to be correlated with some animals and plants metapopulation survival. Like CON has no a clear ecological meaning.

Ecological quality of ecotopes (Q -)

Up today it is not seriously possible to use a single value of landscape "quality", but it's possible to compare more (tested) indices of some landscape aspects. This synthetic index of environmental quality of ecotopes was developed in order to increase the ecological meanings of connectivity,circuitry and heterogeneity, because these indices are greatly affected by the structural and functional characteristics of single ecotopes. The index associates different settled weights (from -10 to 10) to different ecotope classes (woodlot, parking, etc.). These relations have been recorded from scientific literature. In this way the influence of each weight on the index output is explicit. Every ecotope "value" is surface-normalized, to obtain a final global index

Windbreak effect (WIND)

This index is computed by a GIS buffering model that estimates the windbreak effect surfaces on ground generated by the agroforestry network (existing or planned). For each agroforestry system the windbreak surface it is calculated by means of:

- the prevailing wind, setted on the map by a graphic wind star utility;
- the plantation structure, in particular the vertical heigh

the inefficiency of the wind break effect it is proportional to the proportion of the surfaces covered in comparison to those not covered by the wind break effect, and/or to the overlapping excess of surfaces interested by the wind break effect. Values higher or lesser than 100 suggest an inefficient wind break effect at the network level.

Nutrient abatement effect (NUT)

This module it is based on a GIS model that statistically correlate the structural characteristics of the agroforestry systems mapped and the site hydrology and pedology data. For each corridor or patch mapped as network component the abatement rate are estimated by means of:

- the structure;
- the position relative to source land use (crops) and/or to the hydraulic network;
- the site hydrological type, estimated by means of GEO layer data.

Each ecosystem category has a different run off and subsurface nutrient abatement capacity, influenced by its landscape spatial position and by the hydrological condition. A buffer zone between a corn field and its drainage system has an higher abatement capacity of a buffer zone along a secondary road without drainage; a buffer on a very drained soil with vertical deep water movements has a lower abatement capacity than a buffer zone on a soil with with horizontal water movements that interest the root zone. The abatement efficiency class of the model for each buffer category and hydrology class have been conservatively estimated by literature data and field tests. If the hydraulic map is available the GIS based estimation it is based on the spatial relationships between the hydraulic and buffer network. If this numeric layer it is not available, the estimation it is automatically substitute by a simplified routine that sets as 0 the output abatement from the each patch margin not bordered by the buffer network elements, and setting for the other margins the abatement capacity based on the relation described above .

Total length (Ltot)

In a system where the lack of hedgerows is high and/or many of them are not connected this index gives some information about the structural and functional degradation. The value is indicated in meters or multiples to cope with a 0-100 scale.

Comparative loss of crop incomes (EC1)

This index compares the possible loss of crop incomes due to hedgerow planting. For different class of planting structure has been defined corresponding surface of negative effect on crop production (literature data). The comparison of different category of agroforestry systems incomes versus a super-valued correspondent surface of different category of crops incomes is performed by means of an economic evaluation system (20 years Net Present Value). The different agroforestry and agricultural class ahe a default income assignation, that can be updated. The UE incomes are considered in the index computation. These results are automatically extended to all existing and/or planned planting.