New developments for mathematical models in environment evaluations

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The European Landscape Convention [1] encourages all European countries to define their landscape quality objectives on the ground of management, planning and evaluation of the environmental system. The reduction of soil sealing and landscape fragmentation coupled with an increasing of the energy and matter fluxes between ecosystems, is a key issue of sustainable development and bio-diversity preservation. In this context, dynamical models can be useful decision support systems in order to achieve information about landscape evolution assessment and incidental criticality of territorial parameters (e.g. ecological connectivity).

In general a landscape [2] is considered as a spatially extended heterogeneous complex system determined by nonlinear connections among its components (the so-called landscape units) separated from each other by natural or anthrop barriers (i.e. railroads, viaducts, highways, national and municipal roads, edified and industrial grounds, urban sprawl, rivers, lakes, ridges ...). Moreover each landscape unit is once more divided into small portions, called biotopes, classified according to the actual use of its land cover and characterized by biological energy production, measured by the so-called BTC (Biological Territorial Capacity).

The first mathematical models [3] proposed in this context did consider indeed the amount of BTC, relevant to the whole environmental scale, as the state variable of the system. In the last WASCOM in Brindisi, 2011, a more detailed model, taking into account the amount of BTC of each landscape unit, was presented [4]. In the present paper the model acts at the scale of each biotope. Thus this model has the advantage of giving information at a very detailed scale; on the other hand it depends upon an enormous number of equations. In order to overcome this problem and to allow implementation of the model also on a user-friendly software, a suitable approximation process is proposed, giving an a-priori estimate of the errors.