BTC evaluation through a dynamical model related to the ecological graph
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This paper illustrates an approach that uses environmental system's analysis and evaluation, in a landscape contest, using ecological and mathematical models.

In this particular point of view, models that use real spatial data, can show objective and correct results obtained by a mathematical method; mathematical modeling can represent a real and good instrument to work with planning projects, landscape analysis and environmental controls in different time.

The model used in this work, called the " Ecological Graph" can analyze the material and energy exchange between different environmental compositions, all these operations are made in a typical landscape analysis software called Arc Gis.

In a planning view, the environmental systems scientific study is made by landscape Ecology with particular spatial models in order to recreate and simulate the correct system's life; in this operation, models use original landscape control ratings that characterize each system.

The landscape analysis with the application of the ecological graph model and, secondary, with the dynamical model, required a correct territorial placement in order to explain the analysis area. This will be important when we have to individuate the eco-mosaic in the next step.

So, the analysis area is delimited by these natural limits:

- Sangone river in the Northern side;
- Pellice River in the Southern side;
- Po river in the Eastern side;
- A very tall ridge in the Western side.

Then this territorial placement, I studied the eco-mosaic.

Ingegnoli is one of the most important italian ecologistic and he said that the eco-mosaic is a really important element to study the landscape, because it can divide the territory in different levels. Each level has particular life conditions for specific animals and trees and it is different from others levels. So, considering the whole territory, all these levels must co-exist together in different spatial and temporary times and situations.

In an eco-mosaic, each natural element that we can find in an ecological landscape interpretation, is called a biotope.

The ecological graph model, applicable on a territory only after the eco mosaic study, is able to evaluate the ecological stability level in an environmental system; this is very important because this model considers the natural stability like a strong element for the environmental system, in order to create and keep different levels of natural biodiversity.

Another important thing is that, the environmental system stability, (the system's ability to stay in a correct and balanced situation also when there are some problems that can be assigned to human activity on the environmental system) depends directly by the BTC and by energy and material fluxes that born in the eco mosaic inside the landscape.

Energetic fluxes are the main thing that the model analyzed, because they are able to create new life in different landscapes, but this is not possible if they are obstructed by human actions or by infrastructures.

So the main positive thing is that the model tries to study how much different environmental elements in the landscape are connected each other or isolated and fragmented (so energetic fluxes are obstructed).

The ecological graph construction follows the division of the landscape in several different sectors called "ecological sectors" with different area and dimensions. Each sector is a biotope in the eco mosaic. These sectors are divided and separated to each other by different kinds of walls (natural walls like rivers or ridges,..or human walls like cities, infrastructures,..) .

These walls can be passed by energetic fluxes or maybe also not, it depends by how kind of material the wall is made.
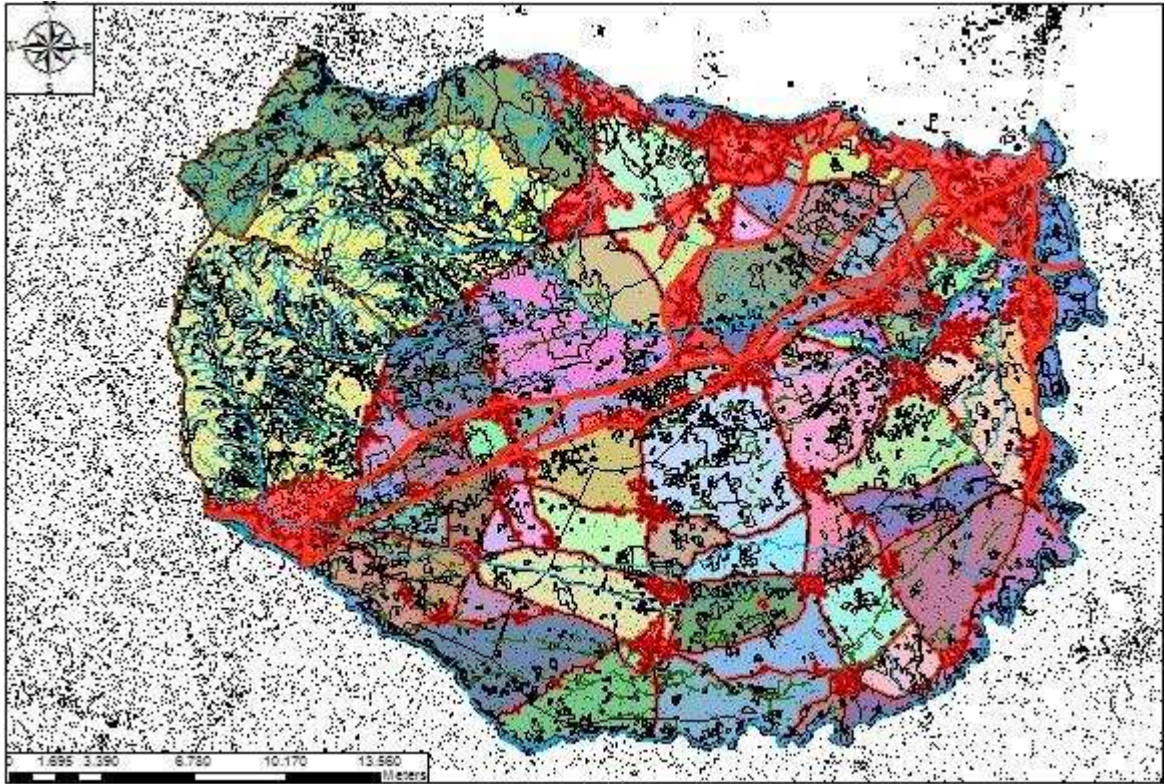
The 72 different sectors

In order to explain the correct use of the ecological graph, here there are some actions that we can do with this model, for example:

- It create a relationship between how many energetic fluxes a biotope can create and how much it is connected or isolated with the other natural elements in the landscape;
- It is able to say how much "big quality green" we can have in our study area;
- It analyses all different kinds of walls that are between ecological sectors in the area and says if one is more passable than another or if it is not.

In the following image, we can see the ecological graph as the main result and object of this big work.
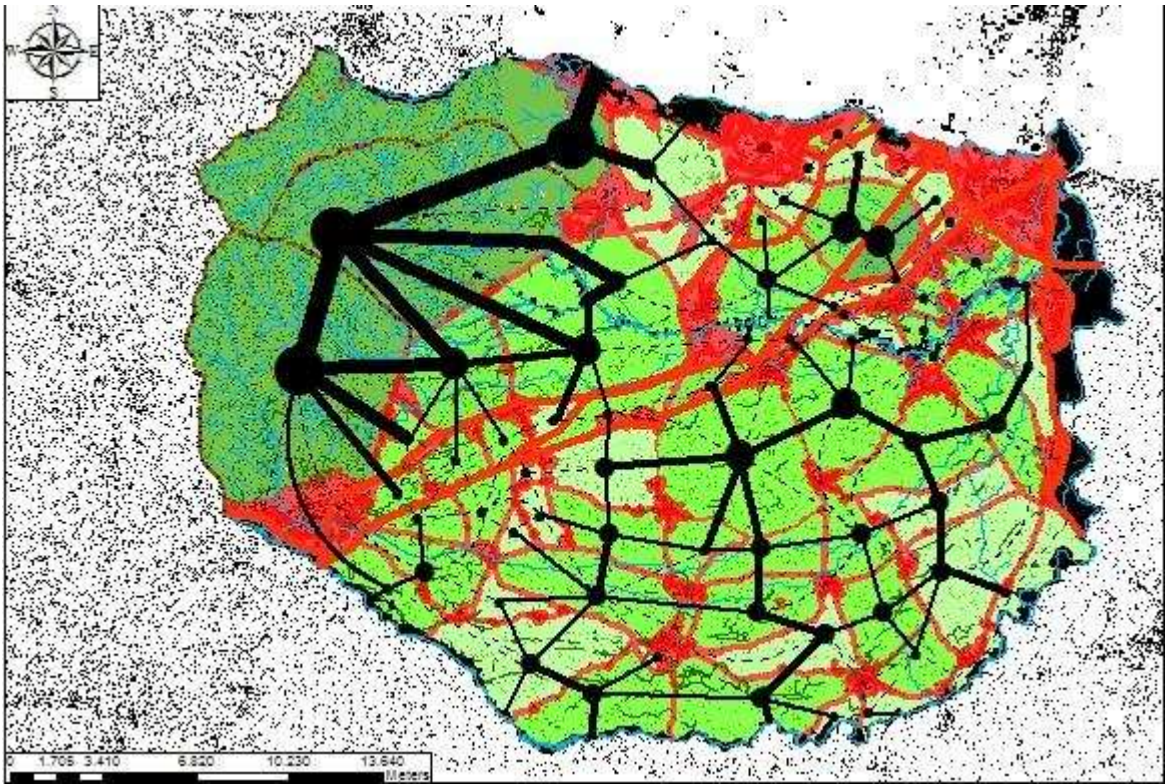
The Ecological Graph

Ecological Graph's items

In the end, we can say that the ecological graph is a useful model that operates on a territory and is able to share results but, at the same time, it doesn't create other problems on the landscapes. We can have a complete analysis of all energetic fluxes of each territory and this is important, because it shows the ecological efficiency of all natural elements that are in the environmental system.

So, this model is able to make a " knowledge photography" of all we have in our environmental system, we can know exactly how our landscape is in this moment and know all energetic BTC fluxes that it can share.

The model is a useful element that can be used in all planning processes, like, for example, the strategic environmental evaluation to control the present situation before planning action and, how the landscape evolves after the planning action.

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