HUMAN–INDUCED OSCILLATIONS IN A NETWORK LANDSCAPE MODEL

ROSSELLA DELLA MARCA

The concept of territorial resilience is closely associated with the ability of a local system to tolerate the impact caused by adverse circumstances. Here, we investigate the role of the human factor in the resilience of environmental systems. To this end, a coupled human–landscape model is proposed for a network of Landscape Units (LUs), where each LU is endowed by a system of ODEs for the time evolution of two environmental variables (fraction of green areas and production of bio–energy) and one human variable (fraction of environmentalists in the population). Injunctive social norms that tend to population conformity are taken into account. First the dynamics in each LU is analytically investigated, with reference to equilibria and their stability; the possible occurrence of Hopf bifurcations is proved, with consequent periodic oscillations of environmental and human variables, as typical of resilient territories. The numerical investigation shows that such oscillations may disappear by global heteroclinic bifurcations. Then, the connectivity between the LUs is considered, with the aim of pointing out the effects of the single LU dynamics on the network landscape model. Numerical simulations of different scenarios are performed in a sample model of an environmental system in Northern Italy.

This is a joint work [2] with Maria Groppi and Ana Jacinta Soares.

References

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Mathematics Area, SISSA – International School for Advanced Studies, Trieste (Italy)
Email address: rossella.dellamarca@sissa.it
URL: www.rosselladellamarca.it