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Dipartimento Interateneo di Scienze, Progetto e Politiche del Territorio
Eccellenza MIUR 2018-2022



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PhD in Urban and Regional Development
IN VARIETATE CONCORDIA

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Wildfire risk: a participatory approach in an alpine socio-ecological system

Abstract

Forests play a fundamental role in providing several ecosystem services. However, climate change and other direct and indirect human impacts are threatening forest ecosystems. Wildfires are one of the most evident results of these driving pressures on fragile ecological equilibriums.

Recent studies have started to assess the correlation between the incidence of wildfires and human socio-economic activities. This work aims at deepening the interactions between human and ecological spheres in the framework of wildfire risk analysis, using a Socio-Ecological System (SES) modelling approach. It focuses on a local-scale case study, Valchiusella, an Italian north-western alpine valley. Like other alpine valleys, Valchiusella has been characterised by strong land-use changes over the last decades, due to rural abandonment and consequent reduction of traditional pastoral economic activities, which in turn impacted the local fire regime.

A mixed qualitative and quantitative approach is proposed, based on the involvement of local stakeholders (municipal administrators, volunteers of forest firefighting teams, forest technicians and workers, farmers and members of local environmental associations) in a multi-step participatory approach. At first, semi-structured interviews were employed for identifying the elements, interactions, challenges and future perspectives of the local SES in relation to wildfire risk. The topics pointed out were related to seven thematic areas: economic sphere, planning, wildfire dynamics, new generations, rural abandonment, inter-group conflicts and ecological sensitivity.

Second, the representation of Valchiusella's SES was transformed into a role-playing game about forest and pasture management, based on an agent-based model. The model simulated the ecological dynamics of the system, such as tree growth, forest encroachment on abandoned pastures and fire behaviour. The players were asked to make territorial management decisions replicating the interactions



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that exist between actors in reality in a protected context of positive dialogue. Local stakeholders were involved in three game sessions organised in different municipalities of the valley. Those sessions demonstrated the ability of the ludic tool to stimulate discussion, facilitate the exchange of knowledge and promote mutual understanding. The game also encouraged the emergence of innovative proposals toward collective management and the development of positive collaborative processes among stakeholders.

The last step concerned fire risk mapping, which was focused on the risk of losing cultural ecosystem services. Two approaches were combined: a quantitative technique for the spatial assessment of fire hazard and ecological vulnerability, based on the fire behaviour simulation, and a qualitative evaluation of cultural ecosystem services. This last involved local stakeholders and experts of land management in a participatory mapping activity of places of interest about outdoor recreation, aesthetic value, and collective and personal sense of place. Finally, the results were combined through GIS spatial elaborations in a fire risk summary map for cultural ecosystem services, using watersheds as basic spatial units. The resulting information on the areas of highest risk is crucial for informing decision-makers on the priority areas of fire prevention.

The involvement of local stakeholders and the adoption of an interdisciplinary approach allowed for multi-faceted findings and important implications for future practices. The results of this study couple the cartographic outputs with social learning and insights for guiding the future development of shared prevention strategies, taking into consideration the needs and vision of the local community.