



## **LANDPLANER (LANDscape, Plants, LANDslide and ERosion): a model to describe the dynamic response of slopes (or basins) under different changing scenarios**

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Landslide phenomena and erosion processes are widespread and cause every year extensive damages to the environment and sensible reduction of ecosystem services. These processes are in competition among them, and their complex interaction control the landscapes evolution. Landslide phenomena and erosion processes can be strongly influenced by land use, vegetation, soil characteristics and anthropic actions. Such type of phenomena are mainly model separately using empirical and physically based approaches. The former rely upon the identification of simple empirical laws correlating/relating the occurrence of instability processes to some of their potential causes. The latter are based on physical descriptions of the processes, and depending on the degree of complexity they can integrate different variables characterizing the process and their trigger. Those model often couple an hydrological model with an erosion or a landslide model. The spatial modeling schemas are heterogeneous, but mostly the raster (i.e. matrices of data) or the conceptual (i.e. cascading planes and channels) description of the terrain are used. The two model types are generally designed and applied at different scales. Empirical models, less demanding in terms of input data cannot consider explicitly the real process triggering mechanisms and commonly they are exploited to assess the potential occurrence of instability phenomena over large areas (small scale assessment). Physically-based models are high-demanding in term of input data, difficult to obtain over large areas if not with large uncertainty, and their applicability is often limited to small catchments or single slopes (large scale assessment). More those models, even if physically-based, are simplified description of the instability processes and can neglect significant issues of the real triggering mechanisms. For instance the influence of vegetation has been considered just partially. Although in the literature a variety of model approaches have been proposed to model separately landslide and erosion processes, only few attempts were made to model both jointly, mostly integrating pre-existing models. To overcome this limitation we develop a new model called LANDPLANER (LANDscape, Plants, LANDslide and ERosion), specifically design to describe the dynamic response of slopes (or basins) under different changing scenarios including: (i) changes of meteorological factors, (ii) changes of vegetation or land-use, (iii) and changes of slope morphology. The was applied in different study area in order to check its basic assumptions, and to test its general operability and applicability. Results show a reasonable model behaviors and confirm its easy applicability in real cases.