



Assessing land use and cover change effects on hydrological response in the river Côa catchment, Portugal. From the plot to the catchment scale.

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Assessing the impacts of land use change, especially the role of vegetation, on hydrological response from the plot to the catchment scale has become one of the widespread issues of scientific concern, in recent decades. The continuous expansion of urban areas, the dramatic changes in land-cover and land-use patterns and the climate change which have taken place on a global scale explain this increasing interest. Although scientists have long recognized that changes in land use and land cover are important factors affecting water circulation and the spatial-temporal variations in the distribution of water resources, little is known about the quantitative relation between land use/coverage characteristics and runoff generation or processes. Therefore, a better understanding of how land-use changes impact watershed hydrological processes will become a crucial issue for the planning, management, and sustainable development of water resources.

In the past decades, abandonment of marginal agricultural land has been a widespread phenomenon in Portugal, as well as in many other countries of Europe, especially in the Mediterranean countries. The abandonment of arable land typically leads to natural succession and to the development of shrub and woodland. Shrubs like *Cytisus* spp. usually establish in study area. A *Quercus pyrenaica* Willd. wood generally appears after a long time, about 3 or 4 decades.

The general aim of this work is to analyse the temporal evolution of water supplies in a Côa basins (located between 41°00' N and 40°15' N and 7°15' W and 6°55' W Greenwich) and relate its behaviour with changes undergone by the plant cover and by the main climatic variables (temperatures and precipitation).

To achieve this goal, dynamics on the land use and land cover were estimated after the second half of the 20th century. The hydrological response under different land uses and plant covers were monitored during 2005 and 2006, using small permanently established bounded runoff plots (8×2 m) that drain to a modified Gerlach trough. Regarding the hydrological analysis at basin scale, a study of the temporal evolution of the monthly and annual discharges (Dam3) was made at two measuring stations, between 1956 and 1999. During this period the river was not subjected to the effects of large reservoir and its data on discharges can be considered representative of the natural functioning under a natural regimen. After 2000, the Côa river functioning was submitted to the effect of a large dam. For the analysis of temperatures and precipitation, the monthly and annual series recorded between 1956 and 1999 were used. To check the degree of significance of the trend with a certain level of confidence and to detect correlations among observed variables, a non-parametric test and Pearson coefficient were applied.

The obtained results show that an important increase occurred on plant covers between 1960 and 2000; scrub plant communities became the most extensive land cover and the most important vegetation type. When a permanent vegetated cover is dominant surface runoff are very well controlled at plot scale. The major part of rainfall is infiltrated. On a catchment scale, the temporal evolution of the annual discharges has been negative and statistically significant (p -value < 0.05). The correlation coefficient between rainfall and discharges was quite significant for the studied period, which means that river discharges are very sensitive to rainfall amount. Nevertheless, the relationship between the variables seems to have a significant change throughout the analysed period, which is confirmed by the observation of temporal trend in residuals, the product of the year-by-year correlation between rainfall and discharge, and time. In general, residuals behaviour are clearly positive before the 80's and negative after this date. This temporal variability could be related with changes occurred in land use and land cover.