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Modeling runoff and evapotranspiration responses to land use changes using SWAT model in the Mundaú watershed, Brazil

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Introduction

In the last decades, around the world, there has been a severe change in the land use and consequently, modification in the hydrological and ecological behaviors. Land use change has great influence on runoff and evapotranspiration processes of any watershed and the deepening of this theme is important to assist decision making, within the scope of water resources management. The aim of the study is assessing the issue of land use change and its effect on evapotranspiration, surface runoff and sediment yield.

Material and Methods

The present study was conducted for Mundaú River Basin (MRB) using Soil and Water Assessment Tool (SWAT) model. Input data like land use, topography, weather and soil data features are required to undertake watershed simulation. Two scenarios of land use were analyzed over a period of 30 years, which were: a regeneration scenario (referring to use in the year 1987) and another scenario of degradation (referring to use in the year 2017). Land use maps for 1987 and 2017 were acquired from satellite images.

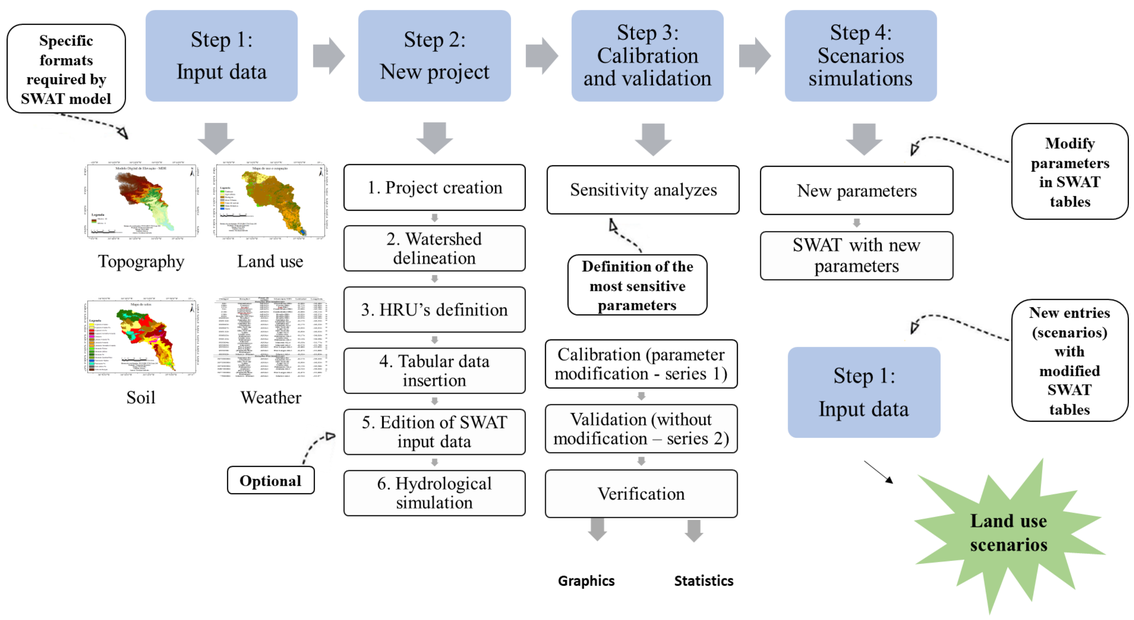

Fig. 1. Conceptual framework of SWAT model and its setup

Results and Discussion

Overall, during the last three decades, 76.4% of forest were lost in the MRB. On the other hand, grazing land increased in 2017 at little more than double the area that existed in 1987. Changes in land use over the years resulted in an increase of about 37% in water yield of the MRB.

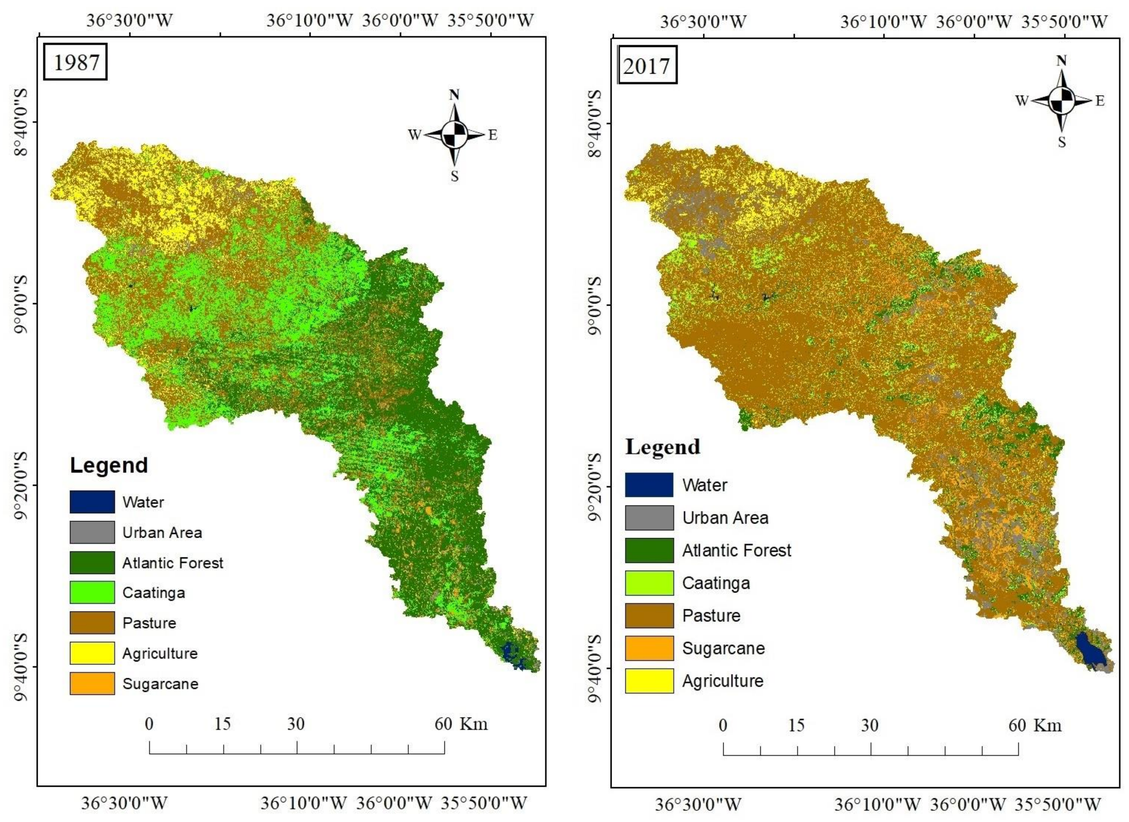

Fig. 2. Land use classes for Mundaú Basin in the regeneration (1987) and degradation (2017) scenarios

Changes have led to increased processes such as surface runoff and sediment yield, and in the decrease of evapotranspiration.

Conclusions

The spatial and temporal distribution of land use controls the water balance and sediment production in the MRB.

Acknowledgments