# An open and flexible land use change model for scenario assessments - alucR - allocation of land use in R

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## Abstract

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Land use change models are important tools to evaluate possible future land uses under different scenarios of policies, trade, socio-economic developments or trends. Current land use change models are frequently difficult to access and to fully comprehend, due to proprietary code, restricted availability or high complexity. Most often adaption of the model to the regional specific settings is limited by the options given within the GUI of the model or by the need to have a good understanding of programming languages (e.g. C++). The aim of this poster is to present a flexible and open source land use change model that can easily be adapted to case study specific needs. We developed and applied the model to test scenarios of land use change for a case study in the Brazilian Amazon.

We use the widely applied and established statistical programming language R as modelling environment. This opens up the possibility for a large number of scientists to easily apply and adapt the model to the specific needs of the case study without knowledge of other programming languages or the need to swap between software products. Methodologically we build on well-established modelling procedure as implemented within CLUE-S [1] or LUCC-ME [2].

Required inputs for the land use change model include suitability layers for the respective land use classes and scenarios of future land use demands. Optional a set of class or pixel wise settings can be integrated, as for example protected areas or specific land use trajectories. A huge advantage of the R-statistical programming language is its capability to process all required data, including the spatial datasets, let it be raster or vector based, and it provides a large variety of statistical methods to estimate the input information. All model-inputs can be prepared within the R-environment.

We demonstrate the capabilities of alucR for a case study of land use change scenarios in the Brazilian Amazon framed within the project carbiocial (www.carbiocial.de). Suitability layers were generated using parametric and non-parametric methodologies. The competition between land uses under the different demands and spatial assumptions were calculated for the years 2010 to 2030. The model proofs robust in depicting land use for the different scenario years and flexible for input layers and restriction. Processes, such as the competition between land uses and or land use displacement from one location to another were depict.

The open source framework makes it possible to adapt and further develop the model, to meet the regional land use change characteristics, and to possibly combine it with other models, as for example with urban growth models. All code is available from https://github.com/fg-code/alucR.

## References:

[1] Verburg, P.H. and Overmars, K.P., Combining top-down and bottom-up dynamics in land use modeling: exploring the future of abandoned farmlands in Europe with the Dyna-CLUE, 2009

[2] Aguiar, A.P., Carneiro, T., Andrade, P., Assis, T., LuccME-TerraME: an open-source framework for spatially explicit land use change modelling. GLP News, v. 8, p. 21, 2012