

Global land-cover and land-use change of the last 6000 years for climate modelling studies: the PAGES LandCover6k initiative and its first achievements

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The goal of the PAGES LandCover6k initiative is to provide relevant, empirical data on past anthropogenic land-cover change (land-use change) to climate modellers (e.g. the CMIP5 initiative). Land-use change is one of many climate forcings and its effect on climate is still badly understood. Among the effects of land-cover change on climate, the best known are the biogeochemical effects, and in particular the influence on the exchange of CO₂ between the land surface and the atmosphere. The biogeophysical effects are less well understood, i.e. the net effect of changes in the albedo and evapotranspiration is complex. Moreover, the net effect of both biogeochemical and biogeophysical processes due to land-use change is still a matter of debate. The LandCover6k working group infers land-use data from fossil pollen records from lake sediments and peat deposits, and from historical archives and archaeological records (including pollen and other palaeoecological records such as wood and plant micro/macroevidence). The working group is divided into two activities, i) pollen-based reconstructions of past land cover using pollen-vegetation modelling approaches, and mapping of pollen-based land-cover change using spatial statistics (e.g. Trondman et al., 2015; Pirzamanbein et al., 2014), and ii) upscaling and summarizing historical and archaeological data into maps of major land-use categories linked to quantitative attributes. Studies on pollen productivity of major plant taxa are an essential part of activity i). Pollen productivity estimates are available for a large number of the northern hemisphere, major plant taxa, but are still missing for large parts of the tropics for which research is currently in progress. The results of both activities are then used to revise existing Anthropogenic Land-Cover Change (ALCC) scenarios, the HYDE database (Klein-Goldewijk et al.,) and KK (Kaplan et al.,). Climate modellers (e.g. the CMIP5 initiative) can use the LandCover6k products as such (i and ii above), and/or the revised HYDE and KK ALCCs. The LandCover6k working group focuses on regions of the world where humans have had a significant impact on land cover during the last 6000 (6k) calendar years (in some regions earlier than 6k ago) through deforestation and diverse agricultural practices, i.e. the Americas, Western and Eastern Africa, Europe, and Asia. In Asia, the emphasis has been placed so far on China, India and Japan.

References: Kaplan JO et al. (2009) *Quaternary Science Reviews* 28(27-28): 3016-3034. doi: 10.1016/j.quascirev.2009.09.028; Klein Goldewijk K et al. (2011) *Global Ecology and Biogeography* 20: 73–86. doi: 10.1111/j.1466-8238.2010.00587.x; Pirzamanbein B et al. (2014) *Ecol Complex* 20:127–141; Trondman A-K et al. (2015) *Glob Chang Biol* 21:676–697. doi:10.1111/gcb.12737.