



Soil erosion risk as a measure of the effects of land pattern changes on runoff processes in the landscape – case studies from Lower Austria and Central Bohemia

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Changes in land use, landscape structure and agricultural technologies affect number of soil characteristics as well as rainfall-runoff processes in the landscape. Soil erosion and sediment transport can be easily used for documentation and quantification of the impacts of land use development in time.

Extent and structure of arable land within a landscape is driven by technological, social and political, factors and differs between countries. However land structure development is more or less natural process and is driven under normal conditions mainly by climatic and economic forces, the effects of political development is very well documented on different sides of the former iron curtain. There is unique chance to compare the trends in historical development during different historical periods given by both of economic and political forces and to search for optimum land structure, using rainfall-runoff processes as a measure.

Land structure analysis and soil erosion risk assessment was carried out for two areas of interest and series of historical periods:

- Lower Austrian municipality of Kleinweikersdorf (580 ha) – 1822, 1945, 1966, 1990, 2008
- part of Botic river watershed in Central Bohemia (810 ha) – 1841, 1953, 1971, 1989, 2003, 2013

Land use delimitation and field plots spatial definition was digitized from available data sources (Historical Cadastral maps and aerial photographs). Changes in crop properties and management practices were also taken into account based on historical information.

Comparison between time periods shows that political actions can cause substantial impact on field plot sizes. At the Austrian area of interest the number of arable field plot continually decreases from 1203 (in 1822) to 371 (in 2008) whereas at the Czech area of interest the initial number of 469 parcels (in 1841) decreases to 32 (in 1989) and then rises again in the last two time periods. While the trend of rising average parcel size in Austria is continuous, in the Czech Republic, there is a trend of decreasing of average parcel size after 1989. Nevertheless, parcels in CR are still significantly larger and land use type did not changed nearly at all.

The parcel borders were used for soil loss calculation with the influence of field plot divisions. The soil erosion risk was assessed by means of distributed USLE approach (Wischmeier & Smith, 1978) (Van Oost & Govers, 2000). Obtained long term soil loss values and spatial distribution were analysed and compared with land use and landscape structure development. At the Austrian area the simulated soil loss increases 2,3 times from 1822 to 2008 (1,8 to 4,2 ton/ha/year), at the Czech area the increase is 4,1 times between 1841 and 1989 (2,3 to 9,5 ton/ha/year) and then the value drops to 5,6 ton/ha/year in 2003 (2,4 times the value of 1841)

In both areas the average soil loss follows the trends in average parcel size, but other effects appear that mitigate the total shift or increase of the extreme values.

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