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SPECIAL ISSUE «ENVIRONMENTAL CHANGE ON THE MONGOLIAN PLATEAU: ATMOSPHERE, FORESTS, SOILS AND WATER»

The Mongolian Plateau forms a part of the Central Asian Plateau and covers an area of approximately 3,200,000 square kilometers in Mongolia and adjacent areas in China and Southern Siberia. It contains one of the world's largest grassland areas, with the Gobi desert in the south and a transition via steppe and forest steppe to the taiga and mountain tundra in the North (Dulamsuren et al. 2005; Miao et al. 2015). Due to its location, the Plateau's climate is continental and semi-arid to arid, characterized by low precipitation (about 250 mm on average), high potential evapotranspiration (almost 1000 mm on average), large temperature amplitudes, long and harsh winters and recurrent droughts (Dorjgotov 2009; Liu et al. 2019). The Mongolian Plateau mostly drains into the Arctic Ocean basin, including the system of the Selenga River and Lake Baikal, which is not only the world's largest freshwater lake but also a natural heritage of global importance (Kasimov et al. 2017). Hydrologically, parts of the plateau also belong to the Pacific Ocean and Central Asian internal drainage basins.

Despite being one of the most sparsely populated regions in the world, the Mongolian Plateau has recently started to experience massive socioeconomic and environmental changes (Allington et al. 2017; Fan et al. 2016). Over the past few decades, the region has been warming significantly above the global average rate (Karthe et al. 2017; Törnqvist et al. 2014). Hydrological effects include decreasing runoff trends and desiccation of some streams (Frolova et al. 2017; Moreido and Kalugin 2017) and the shrinkage of lakes across the entire plateau (Tao et al. 2015; Zhou et al. 2019). Land cover changes in the region are related to both climate change (Karthe et al. 2017; Miao et al. 2015) as well as anthropogenic impacts related to urbanization (Allington et al. 2017; Fan et al. 2016), livestock herding (Allington et al. 2017, Sternberg 2012), mining (Batbayar et al. 2019; Jarsjö et al. 2017) and logging (Batkhuu et al. 2011; Tsogtbaatar 2004). In vast parts of the Mongolian Plateau, forest degradation and losses (Gradel et al. 2017; Juřička et al. 2019a) as well as desertification of grasslands (Khodolmor et al. 2013; Wei et al. 2019) have modified a natural land cover. The key drivers of these processes are mining, agriculture / urbanization and deforestation, which are at the same time major water users and polluters (Batbayar et al. 2019; Jarsjö et al. 2017; Karthe et al. 2017). The above mentioned processes have also had strong effects on the soils, which are affected by anthropogenic impacts

in three major ways: nutrient depletion due to intensive agriculture (Hofmann et al. 2016); soil erosion due to land use change, mining and increasing livestock densities (Sasaki et al. 2018; Sternberg 2012; Wei et al. 2019); and soil pollution (mostly with heavy metals) due to mining, industry and coal combustion in urban areas (Jarsjö et al. 2017; Kosheleva et al. 2019).

The present special issue ENVIRONMENTAL CHANGE ON THE MONGOLIAN PLATEAU: ATMOSPHERE, FORESTS, SOILS AND WATER presents a collection of papers based on two scientific conferences that took place in Ulaanbaatar, Mongolia in August and September 2018. The *International Symposium on Environmental Science and Engineering*, which was held at the German-Mongolian Institute of Resources and Technology, also comprised the *Bringing Together Selenga-Baikal Research Conference*, which continued a tradition of collaborative research and scientific exchange on this unique eco-region. The capacity development workshop *Forestry genetic resources, management and adaption to climate changes,* which took place in Ulaanbaatar and a field station in Domogt Sharyn Gol just a few days later, concluded the most recent Czech-Mongolian forestry project (2015-2018) on introducing advanced forest management and science.

The papers presented in this thematic issue are grouped into three main sections that deal with changes in the atmosphere, forests, soils and water resources respectively.

Atmospheric change. Climatic changes and atmospheric pollution are among the main drivers of environmental change on the Mongolian Plateau. In this issue, the paper by *Antokhina et al* analysed the severe droughts observed during the past 20 years. The authors indentified linkages to increased frequency of anticyclogenesis which are related to changing dynamics of long Rossby waves and atmospheric blocking in the middle and upper troposphere. The authors argue that the heavy rain and flooding observed in July 2018 would mark a new period in hydroclimatological development after prolonged drought during the last two decades in Mongolia and Transbaikalia which has a significant impact on the regional environment. The paper by *Aschmann* addresses the relevance of logistics of the transportation sector for air pollution control in Ulaanbaatar. The author proposes a two step approach towards attaining sustainable mobility in Ulaanbaatar, differentiating between short-term and medium- to long-term solutions.

Forest ecosystems under change. Forest losses due to fires, timber harvesting, insect outbreaks and conversion of forests into mining or pasture land are the key challenges for forest management in Mongolia. An overview of Mongolia's first national forest inventory by *Altrell* provides baseline information on the current state of forests in Mongolia. A review on forest-related challenges in Mongolia and current perspectives for management is presented by *Gradel et al.* For the Khaan Khentii massif in northern Mongolia, *Kusbach et al.* present a macro-scale ecological zonation of forests. Potentials for larch timber harvesting in Mongolia was assessed by *Usoltsev et al.* who compared single-tree biomass data with other ecoregions in Eurasia. Impacts of the invasive four-eyed fir bark beetle on Siberian fir forests were analyzed by *Debkov et al.* The authors found large and healthy tree individuals to be relatively resistant to this threat, whereas smaller and less healthy individuals were more susceptible to beetle attacks. *Juřička et al.* (2019b) investigated the suppression of natural forest regeneration due to the livestock grazing and identified nearby mining as one of the explanatory factors.

Soil and water resources under change. Pollution of air and soils (Kasimov et al. 2011) are further linked with river systems which is discussed in the following section of the special issue. For the cities of Zakamensk (Russia) and Ulaanbaatar (Mongolia), the papers by *Garmaev et al.* and *Shabanova et al*. assessed soil pollution and erosion problems. *Shinkareva et al.* assessed the effects of water pollution on macrophytes in the Selenga river delta which is the biogeochemical barrier of Lake Baikal. Authors argue that the role of delta as natural filters on the path of flows of substances of natural and anthropogenic origin within the Selenga catchment is driven mostly by biogeochemical or hydrodynamic processes and sufficient to protect Lake Baikal.

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