

IS DESERTIFICATION A PROBLEM IN HUNGARY?

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Abstract

The term of “desertification” refers to a land degradation processes of arid, semiarid and sub-humid areas. Although the concept originates from Sub-Saharan Africa, desertification threatens also the area of Hungary. The greatest desertification risk is in the central part of the country, in the Danube-Tisza Interfluvium where drought has always been a huge problem for the local society. Aridification processes are mainly due to climate change. Temperature increase and precipitation decrease as well as the increase of the frequency and amplitude of extreme events contribute to the acceleration of desertification risk. Severe or moderate droughts occur in Hungary nearly every year. Drought frequency has increased, primarily in the last decades. Main findings of several research projects of MEDALUS II and III EU Framework projects (experiments on the effects of climate change on vegetation, soils and ground water level) are summarized in the paper.

Keywords: desertification, land degradation, Hungary, Danube-Tisza Interfluvium

1. Introduction

Desertification processes belong to land degradation processes representing a special and very important group. The concept of desertification dates back to the 1920s (Bovill 1921, cited by Herrmann–Hutchinson 2005) when the extension of the West African Sahara into the Sahel zone was first observed. The term ‘desertification’ was first used by Aubreville (1949) to describe the change of productive land into a desert (Herrmann–Hutchinson 2005). According to this first definition, the term of desertification is always connected with human activities (i.e. with land mismanagement).

According to the United Nations Intergovernmental Convention to Combat Desertification “*Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors*

including climate variation and human activities” (UNCOD 1977). As global climate change has a huge impact on desertification processes, the importance of desertification will increase and it will be the most important group of land degradation processes in those regions of the world where the climate is arid, semi-arid or dry sub-humid.

Desertification is also one of the reasons why migrants have started to leave their home countries. Sub-Saharan Africa is a major region where migrants try to come to Europe, e.g. in July 2015 31,287 migrants applied for asylum in Hungary and the number of applications from Sub-Saharan Africa was 1442 (4,609% of all), coming from the Republic of the Congo, Nigeria, Eritrea, Somalia, Sudan and Cameroon (Biedermann 2016). The percentage values of migrants coming from different parts of the world have been changing continuously during the

last few years and so the above value points only to the fact that Sub-Saharan Africa is also represented among the areas where migrants arrive to Europe from. Political instability, unemployment, famine are more urgent reasons than climate change and desertification, famine, however, is very much related to unfavourable natural conditions and, therefore, to desertification.

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It is important to answer the question whether the issue of desertification is already present in Hungary and if yes, to what extent scientific research has revealed the processes and whether policy making is already aware of that. Therefore, the objective of the paper is to present desertification processes in Hungary, to highlight research activities on the topic and to refer to the policy making efforts in relation to desertification.

2. Desertification in Hungary

Hungary is also threatened by desertification, especially the central part of the country, i.e. the Danube-Tisza Interfluvium where drought has always been a major problem (Faragó et al. 1988). The most affected area, i.e. the Kiskunság, located on the Danube-Tisza Interfluvium has bioclimatic index (P/PET = the ratio of yearly precipitation and the potential evapotranspiration) values near the semiarid threshold value: 0.555 – 0.647, the mean value is 0.600. The calculation is based on precipitation and potential evapotranspiration data of Szász-Tókei (1997). According to the bioclimatic index values, Hungary is an “affected country”. The expected trend of climate change in the country is an increase in temperature and a significant decrease in precipitation and in soil moisture content. As a consequence of this forecast the fight against drought and

desertification is a priority in the country.

Severe or moderate droughts occur in Hungary nearly every year. Drought frequency has unfortunately increased (Szinell et al. 1998), primarily in the last decades. It is expected that one of the possible consequences of anticipated global climate change will be an average decrease of precipitation levels in the Hungarian region by approximately 50-100 mm/°C annually. According to the results of the regression analysis between local precipitation and mean temperature of the Northern Hemisphere, the coefficients were equal to the above numbers between 1881 and 1980 (Mika 1988). At the same time, contemporary regional climate model studies, based on four models, run in Hungary, projected much lower but still negative changes for the future (OMSZ-ELTE 2010).

3. Research and policy making

Research

Research activities on the topic are quite important and the number of projects and publications is also remarkable. Desertification was the topic of quite a number of research projects (e.g. Szalai et al. 2000; Makra et al. 2004; Kröel et al. 2006; Lellei et al. 2008; Kovács-Láng et al. 2008; Rakonczay et al. 2008; Pongracz et al. 2009). Out of the mentioned projects only one example is described below, a project from the 1990s, one of the first ones of the topic.

An aridification research programme was launched within the framework of the MEDALUS (MEDiterranean Desertification And Land USE) II project (EU FW IV, 1994-1996) and MEDALUS III project (EU FW IV, 1996-1999), the Hungarian participant was the Geographical Research Institute of the Hungarian Academy of Sciences (Kertész – Mika 1999). Some test areas were studied in detail and physical processes of aridification were examined and tested. Changes in soil properties, water reserves and vegetation were studied in areas considered most environmentally sensitive.

Groundwater level changes are the main driving forces of aridification processes in the area, accompanied by the depletion of confined groundwater reserves. An extremely serious drought period was registered from the early 1970s until the late 1990s. Soil moisture content also reduced during the 1990s. The dropping ground water level is, however, influenced by many factors so that it is not only the result of aridification (Huszár et al. 1999).

Investigations on soil dynamics revealed that in the most sensitive areas, with the gradual lowering of the water table in alkali ponds and with the complete desiccation of some of them, the direct contact between groundwater and salt-affected soils is interrupted, accordingly, the solonchak soil dynamics ceases, helophile and hygrophile plant associations disappear. The soda content of solonchaks effected by a dry period have leached out from the whole profile. This is the most important indirect evidence for desalinization.

Vegetation changes of the test area were investigated in detail. In four fixed cenological quadrates (represented by various subassociations of perennial *Festucetum vaginatae danubiale* of the Danube-Tisza Interfluve) classical cenological survey was conducted with the examination of plant species which may show quantitative changes, probably associated with climate change. Four plant species were selected: *Euphorbia seguierana*, *Artemisia campestris*, *Festuca vaginata* and *Stipa borysthena*. The findings of this survey confirmed the aridification, too.

At the end of the 90s a wet period started again so there is not enough evidence to prove that the long period of drought reflected also the influence of global climate change. Detailed investigations over a much longer period are needed to make any definite statement possible about the effect of climate change in aridification and desertification processes.

Special attention was paid to water budget parameters. Recent groundwater level changes have been monitored on the Danube-Tisza Interfluve (Kertész 2000) and future trends were predicted.

The main findings of the project point to a well-defined trend towards aridity in Central Hungary. It should be emphasised, however, that the results refer to a relatively short period of increasing aridity.

The conclusions of the project were as follows:

- There is a well-defined trend towards aridity in terms of temperature increase and precipitation decrease. Mean annual temperature values were invariably higher between 1950-1989 than those for the period 1900-1949. The mean annual trend for 1901-1989 was - 0.917 mm (Kertész – Mika 1999).
- Aridification processes have led to detectable changes of environmental factors on the Danube-Tisza Interfluve. Ground water level subsidence was 2-4 m between 1960-1992 accompanied by the reduction of infiltration and ground water recharge. The effect of aridification is already visible in soil development and in vegetation changes.
- Land use changes between 1975-1993 have not shown a direct relationship with aridification due to the higher relevance of economic processes.

Policy making

Legislation activities and policy making are partly directly connected with desertification and partly only indirectly, i.e. through climate change mitigation issues. Climate change is the main influencing factor of desertification processes and, therefore, any action taken against climate change is also an action against desertification.

The National Climate Change Strategy (NCCS) 2008-2025 (NCCS, Act No. LX/2007, V. 28.) is the implementation of the UN Framework Convention on Climate Change and of the Kyoto Protocol. The objectives

of the National Climate Change Strategy will be implemented by National Climate Change Programs to be prepared on a biannual basis. The National Strategy foresees measures in compliance with the EU and international requirements in order to reduce the emissions of greenhouse gases and to prevent their increase. The National Strategy includes the key elements of the fight against the unfavorable ecological and socio-economic effects of climate change and of the improvement of the adaptability to the consequences of climate change including the raising of social awareness about it. Desertification processes belong undoubtedly to the unfavorable consequences of climate change.

The New Hungarian Rural Development Plan includes specific objectives for the improvement of the quality of the environment. Another important aim is the increase of the forest cover of the country, thus, improving the ecological conditions. In conformity with the council regulations 1698/2005/EC and 2006/144/EC a new development plan was worked out for 2007-2013.

The National Agri-Environmental Programme (2253/1999, X.7) is a sub-programme of the National Environmental Programme. The NAEP objectives are in line with NRDP objectives, its target programmes are integrated into the agro-environmental management measure of NRDP. From the aspect of desertification it is important that the NAEP deals with the preservation of protected ecosystems and with Environmentally Sensitive Areas.

The conference on "Drought and aridification" held in October 2009 in Kecskemét (Hungary) issued an important document, a statement about the state of drought and aridification addressed to the Hungarian Parliament asking for the necessary verdicts and measures to ensure the security of water and food supply. This document is the basis of future policy making focusing not only on climate

change mitigation but on the mitigation of desertification as well.

The main issue of Agenda 2030 is to achieve the Sustainable Development Goals. All UN member states adopted the plan. The accomplishment of sustainability goals is an important challenge also for Hungary. Goal 15 is to "protect and promote sustainable use of terrestrial ecosystems, sustainable manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (<https://sustainabledevelopment.un.org/sdg15>).

Hungary and the UN Convention on Desertification

The UN Convention to Combat Desertification in countries experiencing drought and/or desertification particularly in Africa (UNCCD) was signed by Hungary in 1999 and promulgated in 2003. There is a government focal point, i.e. the UNCCD National Focal Point at the Department of Regional Water Management, Ministry of Rural Development. This government agency is responsible for coordinating desertification and drought related government policies in Hungary (http://www.un.org/esa/agenda21/natlinfo/countr/hungary/desertification_drought.pdf)

The National Drought Strategy was elaborated in 2006. The main objective of the National Action Program on Drought Strategy is to provide a framework for the protection and sustainable management of ecosystems in the areas prone to drought. Prevention and control of drought are the main tasks of the activities. The availability of sufficient amount of water for plants is the key issue and therefore the strategy includes the promotion of water-saving farming and tillage systems, the application of manure, appropriate plant protection and weed control.

On June 22 2009 the Hungarian Parliament passed a bill on the preparation of the climate protection framework law (60/2009, VI.24) representing an important step towards combating desertification.

4. Conclusions

In spite of the fact that desertification processes threaten first of all the poorest regions of the Earth they are also present in the more developed parts, too. Hungary is also one of them, therefore, she signed the Convention on Desertification, as increasing aridity is a real national danger, especially on the Danube-Tisza interfluvium. Thus, desertification research is an important challenge for Hungarian geography. Hungary has always been suffering from drought periods. As a consequence of global climate change, drought periods have become more frequent and longer leading to severe damages of the ecosystems.

The answer to the question asked in the title is yes, however, the extent of the problem is not the same as in several parts of the Mediterranean in Europe and on the other continents, especially in Africa. The term "desertification" should be used carefully, citizens and policy makers should not be misled. Desertification is a process, the last phase of which the formation of a desert can be. Concerning the present situation the term "aridification" can also be used, pointing to increasing drought frequency. The expression of "desertification" is, however, worldwide used, policy makers, scientists, international organizations as well as citizens have been using it since long, therefore, the application of the term "desertification" is suggested here.

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