

# It is time to change land use and landscape management in the Czech Republic

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**Abstract.** The identity of man-made landscapes is based on the balance among their ecological, cultural, and economic dimensions. Since the 1950s, short-term economic benefits have globally often outweighed long-term interests. This results in decreased landscape quality manifested as increased erosion of agricultural land, decreased water retention capacity, increased landscape uniformity, and loss of biodiversity. A new phenomenon influencing the condition of man-made landscapes is climate change. Extreme fluctuations of temperature and precipitation have been causing repeated floods and also periods of drought in Europe. Landscapes damaged by inappropriate management are unable to offset these impacts. It is necessary to stop this development by changing land use and management methods to restore the balance among landscape functions.

For the Czech Republic, we propose to develop a long-term landscape vision and to formulate a responsible landscape policy with regional strategic goals, including subsidies and penalties (carrots and sticks), based on the principles of the European Landscape Convention. To promote ecological stability, we recommend allocating funds from the Common Agricultural Policy to both the restoration and maintenance of valuable habitats. Landscape research and management (based on habitat/species monitoring in cooperation with stakeholders) must be strengthened in order to play a proper role in the transformation.

It is time for clear communication with the public and the training of state officials and land users in spatial and landscape planning. To fill this gap in interdisciplinary cooperation, we call for the establishment of a platform on sustainable landscape management in the Czech Republic.

**Key words:** *biodiversity loss; Central Europe; Czech Republic; degradation; ecosystem management in transition in Central and Eastern Europe; European Landscape Convention; landscape transformation; land-use planning; soil and water quality; Special Feature: Ecosystem Management in Transition in Central and Eastern Europe; sustainable management.*

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## Introduction

Natural landscapes have been transformed into cultural ones since time immemorial. In most cases, successive adaptations have led to the formation of man-made landscapes of high cultural value: landscapes integrating natural, cultural, and utilitarian dimensions (see, e.g., the Banat region of Central Europe; Maděra et al. 2014). In many Central and East European countries, however, socialist collectivization in the 1950s, the most intensive (apart from the USSR) being in Bulgaria (~80% of arable land affected) and Czechoslovakia

(~70%), much less intensive in Poland (~10%), followed by restoration of private ownership of agricultural land in the 1990s had negative consequences for land use, which resulted in large-scale homogenous land management and monocultures, extensive use of chemicals (fertilizers, herbicides, and insecticides), and extensive drainage of agricultural landscapes (see Crampton and Crampton 1997). Up until now, natural conditions and ecological relationships in agricultural, forest, and urban ecosystems were largely neglected in favor of exclusively economic considerations (Wascher 2000).

Less diverse landscapes are unable to compensate for extreme weather fluctuations, which are typical manifestations of climate change in Central Europe. This brings unexpected extreme damage to biodiversity, human health, human settlements, and society. The

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economic damage is extreme, often exceeding subsidies to support agricultural production, and contemporary water and landscape management is forced to develop both adaptive and preventive strategies to tackle the hazards of floods and droughts. Landscape management must be transformed in a sustainable manner.

The IALE (International Association of Landscape Ecology) has organized, since its establishment in 1982, several conferences and symposia devoted to rational land use, landscape multi-functionality, land use change, and planning, as well as other topics associated with landscape transformations. Several recent publications clearly show that landscape transformation and restoration are critical topics in contemporary landscape ecology worldwide (e.g., Farina 2000, Mander and Jongman 2000, Brandt and Vejre 2003, 2004, Mander and Antrop 2003, Brouwer et al. 2008, Jongepierová et al. 2012).

The aims of this study are (1) to outline the state of the landscape in the last 60 years in connection with the socioeconomic transformations of the pre-socialist, socialist, and post-socialist eras in the Czech Republic (and former Czechoslovakia); and (2) to suggest ways out of the crisis through setting up a platform on sustainable landscape management in the Czech Republic. Our experience is based on work in a consortium of advisory bodies for the Czech government and the Czech Academy of Sciences (Council of the Government of the Czech Republic for Sustainable Development and the Environmental Committee of the Czech Academy of Sciences; Fanta and Petřík 2014).

### Soil, water, and habitats: how land use affects the landscape

Extreme fluctuations of precipitation and high temperatures are now characteristic of weather conditions in Central Europe (see IPCC 2013). Since 1997, the Czech Republic has suffered at least 10 extreme floods with severe economic consequences and several dozen casualties. Hand in hand with flooding incidents go the increased duration of dry periods and the occurrence of droughts (Rožnovský and Kohut 2004).

This means that Czech society (and not only Czech society) should focus on soil-protection measures in order to increase the water retention capacity of the landscape. Water management and land measures introduced in the socialist era, especially extensive water drainage that affects 25% of Czech land resources, still not only cause excessive water runoff, but also significantly influence the chemical properties of soil and water (Vopravil et al. 2008). Heavy machinery has caused soil compaction, and improper methods of soil management have depleted the amount of organic matter in arable soils by 50% (Šantrůčková et al. 2014). Acidification and contamination commonly leads to the loss of soil (soil sealing, accelerated erosion), and some

regions have already been excluded from production (Hruška and Cienciala 2001; database of soil quality and erosion [in Czech] *available online*).<sup>1</sup>

Another phenomenon is landscape sealing and fragmentation. Habitats are being destroyed, for example, by the construction of large storage centers and trunk roads, and hedges on agricultural land have been virtually eliminated. Inaccessible and unproductive land was spared the direct effects of human activity, but was still subject to indirect effects (e.g., mountain forest dieback from acidification, biodiversity loss due to eutrophication, and a decline of farming; see, e.g., Borůvka et al. 2005, Krám et al. 2012, Hájková et al. 2013). Where direct human intervention ceased (e.g., in abandoned industrial or mining areas and in displaced villages), new areas of relatively undisturbed vegetation (so-called new wilderness) appeared (Vojta 2007). Rare species of vascular plants have disappeared (Grulich 2012), only to be replaced by competitively strong plants (bushes, tall perennial herbs, and grasses) and alien species (Pyšek et al. 2002), and species-rich vegetation has become homogenized and impoverished (e.g., Hédli et al. 2010).

Since the 1950s, major socioeconomic changes have led to drastic deterioration of insect populations and their species diversity on agricultural land (Konvička et al. 2006) and in artificially restored land (Tropek et al. 2010, Řehounková et al. 2011). A drop in the diversity of birds on agricultural land has also been detected (Zámečník and Hruška 2014).

### The science–policy interface

Though ecological research provides ample information, its results are often neglected, and the sectors of agriculture and forestry are mainly oriented toward commercial gain. Such management very often results in the elimination of indigenous wildlife species, destruction of natural ecosystems, and habitat depletion. Sometimes, inappropriate land management leads to the spread of invasive species. Obviously, there are large discrepancies between scientific information and how it gets applied in political decision-making and consequently in land use and land management (Petřík et al. 2007).

Similarly, Czech forest management mostly retains the old practices based on even-aged monocultures/plantations and clear-cutting, widely ignoring natural processes and biological diversity in favor of short-term economic benefits. Three main aspects of the Czech forestry sector have been recognized: (1) an old-fashioned Forest Act, which has fixed traditional forestry concepts and working methods; (2) improper organization; and (3) questionable financial support for unsustainable management in forests, contrasting with

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underfunded biodiversity-related activities (Kotecký 2015).

There is also a major gap between the findings of scientists and water management (Petřík et al. 2008). Coordination of activities among individual sectors is unsatisfactory, and competences are not clearly defined (e.g., among the administrators of watercourses, fishing organizations, and private owners). Conservation and management of inland water biodiversity is inconsistent, extensive pollution is not tackled sufficiently, and there is no clear program for the remediation of unsuitable hydrological regulation of watercourses, which contributes to the increasingly destructive consequences of floods. Despite some improvement of Czech water sources, problems persist mainly in parts of watercourses with lower flow rates and high accumulation of pollution sources. Insufficient attention is paid to integrated river basin management (i.e., river basin plans). Economic management of fishponds emphasizes production benefits and is in no way based on, or even influenced by, the ecosystem approach. It has become obvious that purely technical solutions in water management, which have prevailed over the last two centuries, are not sufficient. Natural river beds with a rich structure of bottom sediments and frequent over-bank flows can and should be used as an effective and relatively cheap means of solving a variety of problems in water and landscape management (Pithart et al. 2012).

These examples clearly document that the practices of land use and landscape management are often not in line with European environmental policy.

### Landscape vision and crisis management

During scientific seminars organized by the Environmental Commission of the Czech Academy of Sciences, scientists and landscape experts have discussed the ways out of the crisis and prepared proposals for political decisions pertaining to this complicated matter: the transformation of land use and landscape management. It is necessary to develop a long-term landscape vision and to formulate a responsible landscape policy for Czech territory, consistent with the neighboring countries of Central Europe. Though some strategic plans have been set up for protected areas, similar tools are not available for the wider landscape.

The ultimate goal of the transformation process is to develop a landscape that will provide better ecosystem services to society. The European Landscape Convention describes the principles of land management to be followed in order to achieve a good result. It enables direct exchange of information and transfer of experience in the field of landscape planning and management, as well as public awareness and participation in political decision-making. For the Czech Republic, it will be not an easy task due to the heritage of land

ownership deformations in the period of the totalitarian regime and the application of large-scale methods of land management today.

To transform the landscape in a sustainable way, the methods, approaches, and decision-making tools for land management, forest management, land use planning, and environmental impact assessment have to be changed. The costs will be high, but this is a consequence of former exploitation approaches. These problems cannot be solved separately and should be addressed across political boundaries; the landscape is a *res publica*.

And it is not only the agriculture sector and the open landscape that should be subjected to change. Attention must also be paid to forestry and open water management at all levels. A critical analysis should show whether Czech forestry policy and forest law are in line with valid EU documents (e.g., the Convention on Biological Diversity, the EU Biodiversity Strategy, or the EU Forestry Strategy). Based on such an analysis of policy, normative tools and measures (organization structures, planning methods, research and education, cooperation with nature protection bodies, etc.) must be adopted to develop a proper professional background of the sector and its working culture. Appropriate steps must also be applied in the management of open waterbodies. Due to economic pressure, many of them have been turned into fishponds and have completely lost their further functions (biodiversity, recreation, etc.) with harmful effects on the open landscape. Similar management transformations should be carried out in all sectors affecting the landscape as a public space and a matter of public interest.

### Controversial subsidies for sustainable landscape management

Financial support is used for the implementation of steps that should lead to a sustainable landscape. Unfortunately, the alarming decline in biodiversity and increasing soil erosion are direct results of the application of EU and national agricultural policies (Zámečník and Hruška 2014). Until now, hardly any research evaluating their effectiveness from the perspective of nature conservation and landscape protection has been carried out (Petřík et al. 2007). The first analysis carried out in the forestry sector clearly shows that some forestry subsidies are not consistent with the environmental goals of the national policy (Kotecký 2015). The current system of agricultural subsidies and donations is mostly used to stimulate the production of selected commodities.

Thus, 25 000 Czech citizens have signed a petition appealing to the Czech government and Parliament to stop the exploitation of the agricultural landscape and to change the system of agricultural subsidies (petition [in Czech] *available online*).<sup>2</sup> Signers of the petition called for

<sup>2</sup> <http://www.zemedelska-krajina.cz/>



grants to be awarded only based on the principle of “public funds for the public good” and used to restore and maintain hedges, terraces, springs, and wetlands, or other features supporting environmental stability and biodiversity, and asked that these features should cover at least 10% of agricultural land. Furthermore, at least 50% of funds from the Rural Development Programme (RDP) are requested to be allocated to supporting nature-friendly ways of farming and forestry and the fulfilment of obligations arising from international agreements, such as the Natura 2000 network, the Water Directive, and the Convention on Biological Diversity (CBD).

According to the only donor of agriculture subsidies, the Ministry of Agriculture, tools of the Common Agricultural Policy (CAP) can identify several economic instruments that can affect farming and promote water retention in the landscape (data portal [in Czech] *available online*).<sup>3</sup> Cross-compliance under the first pillar of the CAP includes statutory management requirements and Good Agricultural and Environmental Conditions (GAEC). Part of this pillar for the programming period 2014–2020 is now called “greening,” which includes differentiation of crops, grassland conservation, and ecologically focused areas. This policy, however, has been broadly criticized by signers of the petition because it covers only a fraction of valuable habitats.

It is difficult for the Ministry of the Environment, the administrator of the CBD in the Czech Republic, to ensure that the measures are targeted more in favor of biodiversity conservation. In order to prevent habitat damage and loss, and to improve cost efficiency, we call for the transfer of at least part of RDP measures under the responsibility of the Ministry of the Environment, for strengthening the control of the subsidies and for the penalization of their abuse.

## What is the Price of Transforming the Czech Landscape? Is There the Will for Changes?

Before one can start planning the transformation, an economic analysis of benefits, losses, and consequent expenses has to be performed. We can, for example, calculate that flood damages in the Czech Republic have reached €6 billion since 1997. For comparison, it has been assessed that €7.4 billion is necessary to cover the cost of measures for improving water retention and accumulation that would protect the entire territory of the Czech Republic (Sklenička 2014).

What are the financial resources? Czech citizens annually pay taxes of approximately €19 billion per year, and large sums of money are invested into unsustainable transport infrastructure (e.g., 1 km of

motorway costs approximately €37 million). On the other hand, approximately €4.6 billion will be redistributed under the EU-funded Operational Programme Environment for 2014–2020 and under the Rural Development Programme. Despite the state debt of €6.7 billion, substantial financial resources could be still used for landscape transformation.

A typical feature of the process of landscape transformation in post-totalitarian countries of Central and Eastern Europe is the unwillingness to accept planning as a tool for managing and steering development. The reasons are twofold: bad experience with the prescriptive planning of the former totalitarian regime and its exact opposite, the market driven economy. Prescriptive planning has caused considerable damage not only to the landscape, but also to material and cultural aspects of public life. Excessive orientation to a market economy without any planning has to be understood as an extreme opposite prescription. It is a short-sighted approach centered solely on economic benefits without any regard for other public aspects of the matter (the so-called “East-European version of Thatcherism;” Myant 2003). Some Western European democratic countries, such as Great Britain, the Netherlands, Germany, or Austria, offer good examples, as they have planned their landscape management. This planning, however, was not a means of manipulation and prescription, but a means of steering, governing, and driving development (Lovejoy 1973, Bradshaw and Chadwick 1980, Dale and Haeubler 2001).

## Call for a platform on sustainable landscape management

Here we propose the establishment of a platform for interdisciplinary and transdisciplinary research into sustainable landscape and ecosystem services to overcome the fragmentation of scientific knowledge, which will collect case studies of best practices and identify (in these positive examples) key factors of success supported by effective integration of scientific knowledge into planning and decision-making processes for sustainable land use development. The platform will integrate research results and ensure knowledge transfer and the platform’s members will cooperate on preparation of regional and national strategic documents (e.g., national strategies on biodiversity conservation). To cover these goals, an interface between policy making and science is needed. Public awareness of landscape issues will therefore be raised using communication tools (public campaigns, seminars, and excursions).

In the Appendix, we present various sub-topics, which can be essential for this platform. Its aim will be to help take concrete adaptation measures and to carry out a legislative and economic analysis for the National Programme to Abate the Climate Change Impacts in the Czech Republic, developed by the Ministry of the

<sup>3</sup> <http://eagri.cz/public/web/mze>

Environment. This program defines the basic objectives and measures against climate change at the national level to ensure, to the maximum extent possible, the meeting of emission targets in the spirit of international agreements, to reflect the contemporary and future social, economic, and environmental situation in the Czech Republic, and to promote sustainable development.

The proposed platform is a follow-up to activities of the European Platform for Biodiversity Research Strategy and Intergovernmental Platform on Biodiversity and Ecosystem Services, which repeatedly recognized the need to develop, integrate, and deploy infrastructure for monitoring and assessment of ecosystem services, open access databases, and virtual institutes for data exchange and analyses and other elements of modern infrastructure.

## Conclusions

As argued throughout, the Czech Government has to face the problems caused by the short-sighted economic vision that has been prevalent in the last 60 years, due to which the Czech landscape has lost a major part of its natural capacity to allay the negative effects of actual weather extremes.

Elaboration of a long-term vision for sustainable use of the landscape is a matter of public interest. Its development and consequent proper use for various purposes is the basic point of all recommendations outlined previously.

Legislative tools and processes needed to ensure the practices of sustainable landscape management are mostly already available (e.g., the Strategy of Adaptation to Climate Change in the Conditions of the Czech Republic). However, for their effective application, it is necessary to take into account broader local considerations and their effective projection into planning processes. Ongoing agricultural subsidy programs must be thoroughly reexamined and adapted to local landscape conditions. As also argued, from the economic, social, and environmental perspective, such changes will lead to substantial long-term savings even though they will also bring substantial short-term expenses.

We therefore propose the establishment of a platform for interdisciplinary and transdisciplinary research into sustainable landscape and ecosystem services where science would meet with and transform into efficient policies. The proposed measures concerning landscape development and land use represent a major change for Czech politicians, land users, land owners, and citizens, who are still rather ambivalent about landscape issues.

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## Supplemental Material

### Ecological Archives

The Appendix is available online: <http://dx.doi.org/10.1890/15-0016.1.sm>