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# Sustainability policy considerations for ecosystem management in Central and Eastern Europe

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**Abstract.** Here I discuss Central and Eastern European (CEE) countries as a region undergoing rapid change, resulting from the collapse of the Soviet Union and admission of some of the states into the European Union. These events brought changes in governance and ecosystem management, triggering impacts on land use and biodiversity. What are some of the policy options toward sustainability in the face of these political, governance, and socioeconomic changes? Some policy considerations for ecosystem management and sustainability include taking a social–ecological systems approach to integrate biophysical subsystems and social subsystems; paying attention to institutions relevant to shared resources (commons) management; and using resilience theory to study change and guidance for governance. Documented experience in CEE seems to indicate shortcomings for both the centralized state management option and the purely market-driven option for ecosystem management. If so, a “smart mix” of state regulations, market incentives, and self-governance using local commons institutions may be the most promising policy option to foster ecosystem stewardship at multiple levels from local to international.

**Key words:** *biodiversity; Central and Eastern Europe; commons institutions; governance; land use; policy options; resilience; social–ecological systems; Special Feature: Ecosystem Management in Transition in Central and Eastern Europe.*

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## Global Change, Regional Change

The earth is undergoing accelerated environmental change, characterized most notably by climate change and rapid loss of biodiversity. Some scientists have proposed a new name, the Anthropocene, for the epoch that began when human activities started to cause significant changes in earth’s biogeochemical cycles and ecosystems. Anthropocene has become an environmental buzzword since about the turn of the century, even though scholars cannot agree on an actual starting date of the epoch. What is clear, however, is that massive changes in the earth system leave us with a 21st century challenge toward planetary stewardship and sustainability (Steffen et al. 2011).

The symptoms of the Anthropocene include, in addition to climate change and biodiversity loss, scarcity in critical resources, the degradation of ecosystem services, and massive changes in land use (Lambin and Meyfroidt 2011). Although many effects are felt at the planetary scale, there are significant differences

regionally regarding causes of change and manifestations of change. Transitional economies undergoing rapid change have some critical choices to make regarding environmental policies, and new directions taken by such countries will probably have implications far beyond their borders.

Central and Eastern European (CEE) countries represent one of the regions undergoing particularly rapid change. The driver of change is largely political. CEE countries experienced profound changes resulting from the collapse of the Soviet Union in 1991, followed by admission of some of the CEE states into the European Union. These events brought changes in governance and ecosystem management, triggering impacts on land use and biodiversity, which is significant because the CEE region plays an important role in European biodiversity conservation and in developing diverse approaches to ecosystem management. The radical political changes that have occurred in CEE countries provide opportunities to experiment with new approaches. Comparisons of the approaches and outcomes in different CEE countries constitute “experiments” that may lead to lessons about how radical political transformations can open new possibilities for sustainability.

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This Special Feature of the journal, *Ecosystem Health and Sustainability*, aims to document and evaluate the impacts of political, governance, and socioeconomic changes in the CEE region on biodiversity and ecosystems. As well, the Special Feature aims to assess risks and opportunities to achieve biodiversity conservation and sustainable ecosystem services. The Special Feature contributes to the central objectives of *Ecosystem Health and Sustainability* to apply theory, principles, and concepts of ecology to support sustainable development, especially in world regions undergoing rapid environmental change.

## Nature of Environmental Change in Transition

How do we characterize environmental change and how do we study transitions and assess risks and opportunities? There are of course multiple ways to approach these questions. One authoritative approach was provided by the UN Millennium Ecosystem Assessment, the first scientific stock-taking at the global level (MA 2005). The MA examined world's various ecosystems and subsystems, and the ecosystem services that they provided for human well-being. An ecosystem "is a dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a functional unit." Ecosystem services "are the benefits people obtain from ecosystems," including provisioning services (such as food and water), regulating services (such as flood control and waste assimilation), cultural services (such as recreational and spiritual values), and supporting services (such as photosynthesis and nutrient cycling) (MA 2005:v). The work of the Millennium Ecosystem Assessment has been extended by IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Díaz et al. 2015).

The study of the relationship between ecosystem services and human well-being can also be carried out in a variety of ways. One approach starts by considering integrated systems of humans and environment (social-ecological systems) as the unit of analysis (Berkes and Folke 1998). This is an approach in which the social (human) and ecological (biophysical) subsystems are considered together, each subsystem consisting of multiple levels, for example, a small watershed inside a larger watershed, or a set of institutions nested in one another, from local to national. The social and the ecological subsystems are linked by mutual feedbacks and are interdependent and coevolutionary (Berkes et al. 2003). For example, this approach considers institutions or rules-in-use not in isolation but as an integral part of the ecosystem, such as a forest or a lake, to which they apply. The ecosystem services provided by such a forest or lake are profoundly influenced by the institutions that govern their use.

Shared resources or commons are sometimes used under open-access or free-for-all conditions, almost always leading to unsustainable outcomes. Or they can

be used under private property or state-property or common-property regimes, or mixes thereof. All three regimes as well as mixed regimes such as co-management (Armitage et al. 2007) are theoretically viable. State property relies on government regulations and top-down decision-making. Private property relies on market mechanisms and makes sense for certain "ownable" resources such as agricultural land. Common property makes sense for resources (and the ecosystem services involved) which are by their nature shared and not "ownable". Examples include grazing lands that may be used jointly by a village, the watershed of a river, and the global atmosphere. These are commons in which, by definition, exclusion or the control of access of potential users is difficult, and where each user is capable of subtracting from the welfare of all other users (Ostrom et al. 1999). Hence, individualistic approaches and purely market solutions do not work. The sustainable use of ecosystem services for human well-being from such commons often requires institutions for collective action and collaborative decision-making (Ostrom 1990).

These institutions are not found at just one level but at multiple levels of organization. Institutions at local, regional, national, and international levels cannot function in isolation but need to work in concert (Dietz et al. 2003). For example, it is not possible to reduce greenhouse gases simply by signing an international treaty. Nor it is possible simply by regulating emissions at the national level. New rules leading to action are needed at local and regional levels as well, for example, by appropriate urban design, use of renewable energies, public transportation, making residential and industrial heating more efficient, and use of sustainable agriculture and sustainable forestry principles. National policies to develop and use renewable energies have to be supported by municipal-level regulations to facilitate them and by the willingness of citizens to use them (Potvin et al. 2015). Solutions for sustainability need to engage institutions at multiple levels, from local to global.

The implication of all of these considerations is that promoting sustainable development requires multilevel, integrative, and interdisciplinary research and action, with attention to both the ecological and the social subsystems. The resilience of the social-ecological system is an important consideration: It refers to the ability of the system to respond to stresses and shocks while preserving system identity and main system functions. In practical terms, resilience is all about options and flexibility. For example, a resilient social-ecological system may have a high diversity of landscapes, native species, and crop species and varieties, as well as a diversity of economic opportunities and livelihood options for its inhabitants.

Social-ecological resilience recognizes the nested character of social-ecological systems (Berkes and Ross 2016). Resilience deals with the challenge of connectivity across the various levels of the system, such as the relationship

of a stand of trees to the forest, or of a creek watershed to a large river watershed (Chapin et al. 2009). As well, it includes the ability of different levels of governments and user groups to communicate and collaborate for governance, especially where it involves key decisions for development (Brown 2016). In sum, the ecological science behind sustainability, and the study of environmental transitions, goes beyond textbook ecology. It uses holistic approaches and ecosystem science consistent with principles of complexity science (Levin 1999), and it takes into account social factors, including considerations of history, economics, and politics.

## Questions for Central and Eastern Europe

The Special Feature aims to explore biodiversity and ecosystem management experiences and approaches in CEE countries in the context of political and socioeconomic transitions in the post-Soviet era. A number of questions were posed by the editors:

1. What is the present state and trends in biodiversity conservation and management of ecosystem services?
2. What are the impacts of political and socioeconomic changes on biodiversity and ecosystems?
3. What can we learn from the assessment of different approaches for the management of biodiversity and ecosystems?
4. What are the current governance systems for biodiversity and ecosystem management in various CEE countries?
5. What are some of the risks and opportunities for biodiversity conservation and ecosystem management in the region?

Papers in the Special Feature deal with these questions, many of the papers addressing more than one. Potocnik (2015) provides a concise survey of governance systems for biodiversity and ecosystem management in CEE. Assessing the transition over some 25 years from regulation by state institutions to regulation by the market, he indicates that the governance opportunity lies with finding a “smart mix” of regulations and market incentives.

Petřík et al. (2015) criticize the short-sighted economic vision of the last 60 years in the Czech Republic, including the negative consequences of the more recent trends of large-scale homogenous land management and monocultures. They discuss the development of a long-term vision and policy for sustainable landscape management that could improve ecosystem services such as the regulation of weather extremes. Also in the Czech Republic, Frélichová and Fanta (2015) provide an example of using long-term land-use data (over about 160 years) as the basis for landscape planning and ecosystem services management. Spatially explicit data for seven kinds of ecosystem services indicate declining trends for regulating and cultural services, and increasing trends for

provisioning services, due to increase in arable land and agricultural intensification.

Hartel et al. (2016) focus on institutional transitions over the past century in Romania’s traditional rural social–ecological systems. They find that the cultural landscapes in their study area show strong links between people and the environment. These landscapes are well equipped to buffer challenges posed by global change; they have elements of rich biodiversity, high natural capital, and healthy provisioning ecosystem services. Also dealing with Romania’s farming landscapes, Dorresteyn et al. (2015) find that traditional land-use practices result in landscape mosaics that underpin land-use heterogeneity and high biodiversity. Using a coupled social–ecological systems approach, they see opportunities to strengthen conservation through linkages between socio-cultural drivers and drivers of biodiversity. Molnár et al. (2016) focus on extensive land-use practices (such as animal grazing) as an approach that is compatible with conservation of biodiversity and ecosystem services. They note that extensive land use survives in protected areas in Hungary in the form of conservation management, and find that herders and conservation professionals share a number of common interests and objectives, creating the opportunity for knowledge co-production between local knowledge and science.

Hanspach et al. (2016) find that features of traditional farming landscapes in Romania, in particular small-scale heterogeneity and gradients of woody vegetation cover, sustain a high functional diversity. The conservation of this cultural landscape biodiversity is threatened by both land abandonment and land-use intensification in the remaining agricultural areas. Valkó et al. (2016) focus on the trend of cropland abandonment in Hungary, noting impacts on landscape-level biodiversity, ecosystem services, and agricultural production. But they also point out that such abandonment could be regarded as an opportunity for grassland restoration. Krkoška Lorencová et al. (2016) use scenarios and modeling to assess different management approaches and future pathways, with their respective risks and opportunities. They focus on impacts of land-use change and climate change on two regulating ecosystem services: carbon sequestration and water purification.

## Conclusions

The nine papers in the Special Feature provide a rich set of ideas and data regarding the rapidly changing landscapes of CEE, and the implications of such change for conservation and ecosystem services. Impacts related to governance and socioeconomic changes on biodiversity and ecosystems in CEE will be of interest to researchers and policymakers in various parts of the world, especially those in other regions undergoing rapid change.

Countries of CEE have a long tradition of land-use research and cultural landscapes, and the papers in the

collection bear this out. As well, the papers expertly deal with biodiversity issues or ecosystem services or both, consistent with principles laid out by the MA (2005). However, only some of the papers consider the integrated nature of ecosystems as fully connected social-ecological systems (Berkes and Folke 1998). As well, theories of change, such as social-ecological resilience, do not seem to be fully used. Resilience theory is widely used in international research and practice to analyze change and to guide development policy (Brown 2016).

Relatively few of the papers deal with institutions, especially commons institutions at the local level (Ostrom 1990). But these institutions are key players in enabling local participation in sustainability governance. How do we bring governance closer to the people, so that the people whose livelihoods are affected, or those who have an intimate knowledge of their ecosystems, would have a say in those decisions? Article A of the Maastricht Treaty of 1992 establishing the European Union specifies that “decisions [should be] taken as closely as possible to the citizen,” also known as the subsidiarity principle (Kooiman 2003). The effectiveness of these subsidiarity policies is suspect, judging by the lack of discussion in the present collection of papers. Could it be that some European Union regulations are getting in the way of self-governance among small-scale producers of CEE countries or getting in the way of co-management of cultural landscapes and other commons of the region (Armitage et al. 2007)?

Some of the papers point out the shortcomings of the Soviet era top-down and centralized state decision-making. However, many of the papers also point out the shortcomings of free-market and neoliberal policies in decision affecting the environment. These shortcomings are not surprising, considering that many of the landscapes and ecosystem services considered by the authors are commons, and sustainable use of commons requires collective action and collaborative decision-making, rather than top-down, centralized governance by the state or by purely market-driven decisions (Ostrom 1990). There is room for a real debate among researchers, policymakers, and the public, as the Potocnik (2015) paper implies: Is the state vs. the market an “either-or” option? Or are there other options and trade-offs among options that require deliberation?

Perhaps the real opportunity lies with a “smart mix” of state regulations, market incentives, and self-governance using local commons institutions. The mix cannot simply be the state and the market; it has to involve a third element, the local people and institutions, for collective action to foster ecosystem stewardship principles (Chapin et al. 2012). This idea has been used in commons management and urban and regional planning for decades. It is gaining increasing support in international conventions as well. For example, COP 11 of the UN Convention on Biological Diversity that took place in Hyderabad in 2012 recognized the importance of collective action and local institutions in biodiversity conservation (Pacheco 2014).

The experience from CEE countries in this Special Feature helps highlight these key policy questions for sustainability that are likely of interest to other countries and regions with transitional economies. The political changes that have occurred in CEE countries have provided opportunities to experiment with new approaches, and these experiments provide lessons about how transformations can lead to new policies and creative solutions, as in the paper by Molnár et al. (2016). Some of the questions raised by the papers in this collection deserve ongoing debate in seeking principles and practices to support sustainability and stewardship appropriate for the Anthropocene.

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