Sustainable Forest Management from Policy to Landscape, and Back Again: A Case Study in the Ukrainian Carpathian Mountains

Marine Elbakidze and Per Angelstam

Abstract To implement sustainable forest management (SFM) policies in actual landscapes, policy actors and managers exercising governance, and different forest stakeholders need to be provided with empirical information of how different SFM dimensions are understood and develop locally. Focusing on the state and trends of SFM implementation in the Ukrainian Carpathians we analyze the barriers and bridges at multiple levels from the national to the local management unit. First, we review the national Ukrainian policies relevant for forest and woodland landscapes, and describe how the involved stakeholders implement policies top–down. Using the Skole district in the Carpathian Mountains as a case study, we then describe the status of SFM dimensions, and evaluate the implementation process bottom–up. Interviews and analyses of official statistics show that three types of gaps need to be bridged: (1) a policy creation gap between the local level situation and ecological, economic and socio–cultural needs at the national and regional levels; (2) a policy implementation gap between the official definition of SFM, and how its different criteria and objectives are understood by forest stakeholders; (3) a knowledge gap between the need of a holistic transdisciplinary approach for SFM implementation, and the present sectoral approach to governance of forest landscapes and disciplinary research. Ways of bridging these gaps are capacity building, introducing arenas for collaboration, and applying a zoning approach at multiple scales to satisfy economic, ecological and socio–cultural dimension of SFM.

M. Elbakidze (✉) · P. Angelstam
School for Forest Management, Swedish University of Agricultural Sciences, P. O. Box 43, SE 739 21 Skinnskatteberg, Sweden
e-mail: Marine.Elbakidze@slu.se

J. Kozak et al. (eds.), *The Carpathians: Integrating Nature and Society Towards Sustainability*, Environmental Science and Engineering,
DOI: 10.1007/978-3-642-12725-0_23,

1 Introduction

Sustainable forest management (SFM) is a concept in transition from a focus mainly on sustained yield of wood to production of multiple goods, services and values (MCPFE 1993, 1995, 2001, 2007; Higman et al. 1999; Kennedy et al. 2001). Since the early 1990s the international forest policy discourse recommends that economic, ecological and socio–cultural values should be taken into account (Kimmins 1997; Salim and Ullsten 1999; Lindenmayer and Franklin 2002; Nilsson 2005). In Europe this is clearly reflected in the Pan-European forest policy process, which has set a suite of criteria and indicators to define these values in more detail at the Pan-European level (MCPFE 2001, 2007; Rametsteiner and Mayer 2004). Similar developments have occurred at the national level (Krott et al. 2000; Angelstam 2003; Balashenko et al. 2005). To implement SFM, Boyle et al. (2001) suggested a triad of activities including developing governance as a process of providing a vision and direction for sustainability, management as the operationalization of the vision, and monitoring of indicators representing agreed values to provide feedback by synthesizing observations to narratives of how the situation has emerged and unfolds. The tools required for each step are manifold (Higman et al. 1999; Nilsson 2005; Szaro et al. 2005), and need to be adapted to local and regional conditions.

While there is consensus at the international policy level about applying the idea of three pillars of sustainability—ecological, economic and socio–cultural—to forest management, the different sets of values shows large variation in the current focus and trajectories of development among countries and regions (e.g., Angelstam et al. 2005). Solberg and Rykowski (2000) stressed the need to acknowledge the range of conditions in different countries and regions when providing policy recommendations. As forest goods, ecosystem services and values have become increasingly globalised commodities, there is a need both to understand the local and regional footprint of international demands, and the suite of policy instruments and management approaches which are appropriate under different biophysical, economic and socio–cultural conditions, and systems for governance (Angelstam 2003). Understanding the effects of the international forest policy discourse and the globalization of the forest sector on the one hand, and traditional local, regional and national factors on the other, requires research based on multiple case studies (Elbakidze et al. 2010).

In Europe, the Carpathian Mountains are a unique laboratory for studying forest management units located along an European gradient between the West and East employing a diversity of top–down and bottom–up approaches. Implementation of SFM on the ground in the Carpathian Mountains region requires combination of different sets of tools to:

1. protect "a unique natural treasure of great beauty and ecological value, an important reservoir of biodiversity, the headwaters of major rivers, an essential

habitat and refuge for many endangered species of plants and animals and Europe's largest area of virgin forests" (Anon 2003b),
2. maintain traditional village systems (Elbakidze and Angelstam 2007),
3. develop multiple economic use of forest resources for local, regional and national development (Anon 2003b).

The Carpathian Mountains go across eight countries extending from north-eastern Austria, via the Czech Republic, Slovakia, northern Hungary, southern Poland and south-west Ukraine, into Romania and Serbia (Webster et al. 2001; Turnock 2002; Opelz 2004). Of the Carpathian countries all except Austria are in transition from socialist planned to market economy. These complex economic and political changes provide an excellent "pseudo-experimental" opportunity for multiple case studies using countries (Mikusinski and Angelstam 1998), regions and local landscapes (Angelstam et al. 2004a, b; Elbakidze and Angelstam 2007) as replicates.

Ukraine is located in the geographical centre of Europe with both zonal and azonal forest ecoregions (Mayer 1984), and represents a globally relevant range of gaps to be bridged to implement SFM in actual landscapes. During the socialist period until 1991 intensive development of the Ukrainian industry had a negative impact on the environment in several important forest regions due to air and soil pollution (Szaro et al. 2005) and unsustainable use of groundwater supply (Buksha 2004; Zibtsev et al. 2004). Clearing of forests for agricultural development during historic time and more intensive forest management during the socialism period led to forest fragmentation, and later a large proportion of planted (45.6 %) forests.

The Ukrainian Carpathians cover 3.5 % of Ukraine's area and 10.3 % of total area of the Carpathian Mountains. This region has forest resources of high economic value, and has retained both cultural and natural biodiversity, and many of Europe's last wilderness areas (Turnock 2002; Angelstam 2006). The ecoregion is also home to several ethnographic groups of Ukrainians—Lemko, Boiko and Hutzul—who have been shaping mountain landscapes for centuries and have created a rich cultural heritage (Anon 1983; Hajda 1998; Elbakidze and Angelstam 2007). Nowadays people in many parts of the Ukrainian Carpathians have experienced decreased standards of living due to disintegration of the planned economy developed during socialism, and ongoing transition to market economy under acute political and economic crisis in the country. The picture is, however, very complex, especially as most of the Carpathian ecoregion has been part of Austria–Hungary, Poland and the Soviet Union during the past centuries. Legal and illegal extraction of wood and non-wood forest products has become a vital source of income for many people in the Carpathian Mountains. Additionally forests and woodlands provide subsistence for livelihood of a large village population, which lives in close proximity of forests (Elbakidze and Angelstam 2007).

To promote sustainability on national as well as regional and local levels Ukraine has joined the process of developing SFM ideas and principles oriented towards sustainable yield forestry, maintenance of forest biodiversity and socio–cultural values (MCPFE 2003; Anon 2006). The strategic objectives of the national forest policy are related to those enumerated in international agreements

of sustainable development, sustainable use and protection of European forests. Ukraine has also signed the 17 resolutions of the Ministerial Conferences on Protection of Forests in Europe.

The aim of this study is to provide an example of a case study approach including the formulation of policy, management and feed-back based on how the situation in a concrete forest management unit, unfolds over time using quantitative and qualitative data. We evaluate the policy implementation process related to the sustainability of landscapes dominated by forest and woodland by using the Skole district in Ukraine's Carpathian Mountain region as a study area. To understand how SFM is defined, implemented and understood in the chosen case study, we first review the national policies relevant for the development of rural forest and woodland landscapes. We then describe the institutions and policy instruments translating policies "top–down" to the management unit we chose as case study. The resulting state of different local level dimension of SFM is then summarized. Finally, we discuss the implementation process "bottom–up", or how policy messages are fed back to the policy level again.

2 Study Area

Our study area is the 147,100 ha Skole district, which is situated on the north-eastern side of Eastern Carpathian Mountains in the upper part of the Dniester river basin and its tributaries Stryi and Opir in Lviv region. We used the Skole district as a "landscape laboratory" to understand how SFM has been implemented to satisfy ecological, economic and socio–cultural dimensions taking into account cultural heritage and natural landscape legacies of the region. Extending from 200 to 1400 m a.s.l. the Skole district ranges from cleared broad-leaved forest with agricultural land, villages and remnants of oak (*Quercus* spp.) forest to managed spruce (*Picea abies*) forests, remnants of natural beech (*Fagus sylvatica*) and beech–fir (*Abies alba*) forest to high altitude natural spruce forest (Holubets et al. 1983; Hensiruk et al. 1998). The Skole district has five state forestry enterprises (SFE), which are responsible for forest management and conduct commercial activities in 78 % of the forest area. The National natural park "Skolivsky Beskydy", which was created in 1999, covers the remaining 22 % of the total forested area. There are 55 villages and 1 town in this district. Recreational and tourism activities are connected with forests.

3 Methods

Working with a complex concept such as SFM on a landscape level requires special emphasis on finding platforms for integration among ecological, economic and socio–cultural values. This applies both to the relevant disciplines and landscape's actors and to the desired integration from policy to practice, and back

again (Clark 2002). The landscape concept is a means of achieving this because it can be used both in the sense of territory and the sense of place (Head 2000). The latter emphasizes the interconnectedness of natural, social and cultural, as well as of temporal and spatial processes, in the evolution of a particular landscape. The landscape concept also reflects the need to expand the spatial scale of management, i.e., to move from smaller spatial units or objects to the scale of landscapes and regions, i.e., include micro, meso and macro levels (Lindenmayer and Franklin 2002; Elbakidze et al. 2010). Additionally, the corresponding social organizational scales must be considered (Manfredo et al. 2004).

To study the process of implementing SFM policies one must view natural and socio–cultural components in a temporally and spatially expanded context. Thus, we consider that a forest landscape forms a whole entity, where natural and cultural components are intermingled, and cannot be viewed as separate entities or processes (e.g. Elbakidze and Angelstam 2007).

We analyzed national forest legislation to understand the compliance with the international SFM discourse. To understand the official institutional arrangement, expert interviews were done with all local stakeholders responsible for management of forests as well as with the heads of local and regional communities in the study area. We made semi-structured open-ended interviews with directors and the chief foresters of all five state forest enterprises in the Skole district and with the director of the Skolivsky Beskydy national nature park (total 11 interviews). Additionally, interviews with representatives of three local communities were made to understand how policy implementation was perceived locally. In total 14 interviews were taken in spring–summer 2006. The standard interview manual contained several groups of questions including personal data of the respondents, data about forest composition and structure, ownership patterns, company's attitudes to forest management and conservation, biodiversity status, changes in forestry, and logistics of forest practices. In 2007 we organized a round-table discussion concerning the ecological, economic and social–cultural dimensions of the current situation in the study area with 15 representatives of forest enterprises, forest business, and administrations of regional and local communities. Finally, analyses of published socio–economic statistic data for the Skole district (Anon 2004) and the forest inventory data from 2006 as well as forest management plans of the state forest enterprises were used to quantify the state and trend of ecological, economic and socio–cultural dimensions of SFM.

4 Results

4.1 The National Policy Level and Institutional Framework

Ukraine has joined the process of developing forest management ideas and principles along the lines of the global SFM discourse. The country has thus supported and signed many resolutions of the Pan-European Ministerial conferences on SFM.

Additionally, bilateral agreements about cooperation in sustainable forestry with neighboring countries (Austria, Poland, Russia, Slovakia) have been signed, as well as the Carpathian Convention. Today the principles of SFM are adopted into the national legislation and forest programs (Synyakevych 2004, 2005; Anon 2006). The official forest policy is thus to provide a balance between the conservation of forest ecosystems and the continuous, multi-purpose use of forests. In Ukraine legislative frameworks of forests and forest resource management are formulated in the Forest Code of Ukraine (Anon 2006), Law on the Environmental Protection of Ukraine (1991), the governmental program "Forests of Ukraine during 2010–2015" (Anon 2009) and other legislative documents and governmental regulations that play a fundamental role in developing environmentally sound forest operations.

The Forest Code (Anon 2006), stipulates that forests have primarily soil protective, water-conservation, air-cleaning and health-giving functions, while their economic use is considered as having limited importance. According to the political and legislative documents the main goals of forestry in Ukraine are (Hensiruk 1992; Buksha 2004; Zibtsev et al. 2004; Anon 2006, 2009):

- to conserve biological diversity in forests,
- to extend forest covered territory to an optimal level in all natural zones,
- to protect forest function and to limit forest exploitation,
- to improve social protection of forestry workers,
- to increase the resistance of forest eco-systems to negative environmental conditions,
- to improve forest management legislation according to international principles of SFM,
- to encourage the development of forest research and education.

All forests are divided into the following four categories: protective forests (to fulfill mainly water-and soil protection functions); recreational forests (to fulfill mainly recreational, sanitarian and health care functions); forests for nature conservation, scientific, historical and cultural purposes; forests for commercial use (Anon 2006). According to the Forest Code (Anon 2006), forests may be owned by the state, privately owned or owned by communities. Forests may also be leased out temporarily or permanently for different kinds of utilization. Permanent forest lease is allowed by state forestry enterprises and other organizations which have special departments to conduct forest management and provide special use of forests and forest resources for hunting, recreation, research and education. Parts of the State Forest Fund may be leased out for periods of 3–25 years to enterprises, organizations and private citizens both of Ukraine and other countries for multiple use of forests. A total of 68 % of the forested areas are under permanent holding of state forestry enterprises subordinated to the State Agency of Forest Resources, 23 % are managed by Ministry of Agriculture, and 9 % are managed by Ministry of Defense, Ministry of Transport, Ministry of Ecology and Natural Resources and other organizations (Zibtsev et al. 2004).

There is a division of the forests resources into resources of state importance (wood from final harvest and resin collection) and resources of local importance (all other products) (Anon 2006). All citizens have the right to walk in the forests, pick berries and mushrooms. Any other utilization is connected with a fee.

4.2 The Forest Policy Implementation Process

There are three main levels of forest policy implementation in Ukraine: national, regional and local. The Supreme Council is the central legislative body and defines the principles of state policy in the sphere of forest relations; passes laws regulating relations in this sphere; approves state programs related to the forests' health, protection, use and reproduction; and decides on other issues in the field of forest relations in accordance with the Constitution of Ukraine (Anon 2006).

The state body especially responsible for forestry in Ukraine is the State Agency of Forest Resources and its departments on regional and local levels. Driven by the transition towards market economy from 1991, the governance system in Ukrainian forestry has been restructured. Compared with the Soviet time forestry and the wood products industry were split into two distinct bodies in 1996 when the State Committee of Forestry replaced the Ministry of Forestry. The wood-processing sector was to a large extent privatized (Popkov et al. 2001).

The State Agency of Forest Resources ensures regeneration and improvement of the forest stock, to provide protection and conservation of forest as well as providing an organization for forest resources and their use (Anon 2006). The Supreme Council, the State Agency of Forest Resources and the Ministry of Ecology and Natural Resources are the main policy makers and the dominant actors in the Ukrainian forest sector (Anon 2006).

The Ministry of Ecology and Natural Resources is the main responsible governmental body to perform, coordinate and control all issues related to forests' health, protection, restoration and reproduction. It also participates in the development of national, state and regional (local) programs on conservation, protection, use and reproduction of forests; and approves the defined norms of forest resources' use; organizes an environmental assessment on the impact of industrial activities on forests (Anon 2006).

Each main actor at the national level has own representatives at the regional and local levels. For example, the State Agency of Forest Resources is represented by 25 regional forest management units. They oversee 230 local state forest enterprises, 14 state hunting and 50 forest hunting enterprises, seven strict natural reserves, four national nature parks and 16 wood industry, road-building, special forest protection, forest inventory and other enterprises (http://dklg.kmu.gov.ua, retrieved 2011-05-29). The practical implementation of the forest policy is carried out by state forest enterprises. Their functions include forest regeneration and management of the wood supply. The range of activities of the state forest enterprises differs among regions. The extent of these activities depends on the

local availability of resources and production capacities (Nijnik and Oskam 2004; Anon 2006). Finally, the local governments have responsibilities to allocate forests for permanent or temporary use.

4.3 Skole District: Ecological, Economic and Socio–Cultural Dimensions

4.3.1 Legacies of the Historical Development

The dynamic history of the Carpathian Mountain region with a range of different governance and management paradigms has influenced forest landscapes in many dimensions. Understanding these legacies of the past is an important starting point for the implementation of SFM in this diverse region. Considerable deforestation of the Eastern Carpathians began about 7000 years ago when the mountains came under the influence of primitive agricultural activity (Kalynovych and Sytnyk 2003). In the pre-agricultural period, the Skole area was populated predominantly by Slavic tribes, which were engaged in hunting, fishing and gathering since the mid-Neolithic period (Portenko 1958). In the second half of the fifteenth century, Boikos, a tribe or ethnographic group of Ukrainian highlanders who inhabit both slopes of the middle Carpathians, began to settle in the Skole area. They introduced slash and burn farming. The use of fire led to a considerable decrease in coniferous species, such as Norway spruce and fir.

Local people maintained the traditional land use almost until the nineteenth century. The agricultural and forestry practices of that time were to a certain extent a prototype of an environmental-friendly and locally sustainable use of natural resources. The Boikos depended completely on the availability of local natural resources, and on the maintenance of an ecologically balanced environment with minimal use of imported resources, goods and energy (Anon 1983).

Historically, Poland and the Austro–Hungarian Empire on the one hand, and Russia on the other, divided today's Ukraine geographically into an eastern and a western multi-ethnic sphere. Continuous external political, economic and social influences have resulted in the decline of traditional forest and land use systems. The character and intensity of the use of natural resources in Skole area began to change in the nineteenth century. As a result of high demand for wood in West European countries, the forest industry began to develop. Forests were cut, and mostly exported as timber, which was transported by means of river (Hensiruk 1964; Trokhimchuk 1968). As a rule the wood harvested was not used efficiently. The areas cleared of forests were not reforested again. Only a small quantity of wood was processed at the same place where it was cut down (Hensiruk 1964).

Starting in 1874 the wood export situation improved as railroads begun to be built across the Carpathian Mountains. Large areas of beech forests were burned in order to produce potash, which was also exported. The Carpathian Mountains had

thus become a source for various kinds of wood and wood products at the international market place. The demand for spruce wood on the world market and the rapid decrease of the supply prompted the owners of the forests to replace the deciduous forests with spruce. In 1882 this tendency was legalized by the Austrian government, which passed a resolution to replace beech, fir and other forests with Norway spruce forests of Austrian geographic origin (Hensiruk 1964). Only at the end of the nineteenth century, the first attempts were made to reduce forest exploitation and to restore forests. In 1894, the Austrian government passed a law regulating the use of forests and instituting responsibility to care for young trees (Hensiruk et al. 1998).

A complete change of political, social and economic relations in the country that had a profound influence on the ways in which natural resources were used was initiated in 1939 when the Western regions of Ukraine became part of the Soviet Union. The Soviet regime (1939–1991) had an especially disastrous impact on the local people's way of life and use of land. Private land property was expropriated, people were forced to emigrate, arable lands increased at the expense of wooded grasslands, and forestry became more intensive (Trokhimchuk 1968). The structure of land and forest properties was changed. Forests were now owned by state, private plots of land were joined into collective farms. Collectivization and mechanization left no space for the traditional way of life (Trokhimchuk 1968). The use of natural resources in Skole area during this period was shifted towards industrial use of forests with spruce reforestation, which was caused by the growing importance of forestry in the Carpathians in general, and within the Skole district in particular. This was accompanied by an increase in both harvesting and reforestation.

4.3.2 Ecological Dimensions

Changes in forest environments caused by long or intensive wood harvesting include loss of species (a compositional aspect); reduced amounts of dead wood, large trees, old and structurally diverse stands and intact areas (structural aspects); and altered processes (functional aspects) (Peterken 1996). The forests of Skole district have more than 200 years of forest management history. As a result of this long and intensive forest exploitation several elements of forest biodiversity have been altered.

Data from 2006 show that of the total Skole district area (147,100 ha) forests occupied 71 %, agricultural land 25 %, urban areas 2 %. According to Holubets and Odynak (1983), natural forests of the Beskyd area with increasing altitude were made up by beech, beech–fir, spruce–beech–fir, fir–spruce. Pure spruce forests at lower altitude were not found. Intensive forest exploitation led to reduction of beech and beech–spruce–fir forests in Skole area. Oak forests in the valleys were reduced to a minimum already in the seventeenth century. At present time, monocultural spruce plantations prevailed. The dominant species were Norway spruce (59 %), beech (30 %), and fir (5 %). Middle-aged and young

Fig. 1 The bark-beetle is one of the main "destroyers" of spruce forests in the Ukrainian Carpathians. The tracks of bark-beetle in the bark of Norway spruce (photo credit: Marine Elbakidze)

stands covered more than 70 %, and premature and mature stand a total of 28 % of forested area, most of which were in protected areas. According to unpublished forest enterprise data and interviews with state forest enterprise directors, between 30 and 60 % of the forested area under their management suffered from insects and root rot, which cause death to Norway spruce stands (Fig. 1). To conclude, human forest activity has created ecologically unsustainable forests, the economic potential of which is not fully utilized.

The protective and protected forests, in which final felling was prohibited, covered 61,700 ha, or 61 % of the forested area. This included forests within the national nature park "Skolivsky Beskydy" and also forests along riverbanks, shelterbelts along railways and roads, green belts of settlements, and forests around sub-alpine meadows. Inappropriate logging and road building techniques continued to be one of the greatest obstacles to SFM in the Skole district. Cutting streamside buffer zones, skidding across rivers and up riverbeds, point-source pollution, and the reliance on obsolete or inappropriate timber transport technology characterized the logging practices. Decreased site productivity, soil compaction, sheet and gully erosion, mass movement, sedimentation, decrease in water quality and fish habitat were manifestations of these poor logging practices (Bihun 2005). Habitat loss and fragmentation was thus evident for both terrestrial and aquatic ecosystems.

Nevertheless, specialized and area-demanding species representing natural forest landscapes occurred in the study area. Of special interest were black stork (*Ciconia nigra*), lesser spotted eagle (*Aquila pomarina*), capercaille (*Tetrao urogallus*), brown bear (*Ursus arctos*), wolf (*Canis lupus*), lynx (*Lynx lynx*), wild cat (*Felis silvestris*), badger (*Meles meles*), pine marten (*Martes martes*), otter (*Lutra lutra*), and European bison (*Bison bonasus*). There were also seven breeding species of

owls and nine breeding species of woodpeckers (Anon 2003a, b). This indicates the biodiversity status was not as deteriorated as in many West European countries (Angelstam et al. 2004a, b). An important factor contributing to improved ecological sustainability in the area was the creation of the national nature park "Skolivsky Beskydy" in 1999. The park's territory covers 24.3 % of the total area of Skole district, including 7.5 % of the total district's area of strict and regulated nature protection management. The national park was a refuge for 29 animal species from the Ukrainian Red List, including 22 animal species from the red list of the Bern convention and five species from the European Red List (Anon 2003a, b).

Natural reforestation of abandoned agricultural land in the valley bottoms was a widespread present phenomenon in Skole district. Marginal lands of former collective farms, which were not used any more for grazing and crop production are been covered by forests due to natural succession dynamic. The effects of natural reforestation on biodiversity were diverse and complex including both loss of important habitat types in the cultural landscape and initiation of secondary succession of use for other species (Mikusinski et al. 2003).

4.3.3 Economic Dimensions

The number of inhabitants in the Skole study area was 48,900, including a rural population of 35,800 (73.2 %), and with 26,500 people of working age. Since 1989 the local population had decreased by 2,600 people. The average population density was 33 person/km^2 (Anon 2004). The number of employed people in the district was 17,600 (66 % from total people in workable age and 49 % from total population), including 6,043 employees of state enterprises (22.8 % of the total people in workable age or 12.4 % of the total population) (Anon 2004). The main individual employers in the Skole area were educational foundations (6.5 % employed people from total number of workable age), forestry sector (3.6 %) and health service (3.2 %).

The forest in the Skole district belonged to the state. The State Agency of Forest Resources controlled 63.3 % of the study area's forests. The former collective farm forests (26.3 %) were under the jurisdiction of the Ministry of Agriculture. The Ministry of Defense and other ministries managed the remaining forest area. There were five state forest enterprises, one national natural park "Skolivsky Beskydy" (SBNNP) and five state hunting enterprises. The total area under the management of the state forest enterprises was 80,912 ha (or 80 % of forested area). The per capita non-state (private and commons) land distribution in the Skole district is 2.99 ha/person, of which 0.26 ha/person is arable land.

According to the 2006 forest inventory data, the total growing forest stock was 29.98 million m^3, including 20.41 million m^3 of conifers (68.1 % of total growing stock), 6.14 million m^3 of mature and over-mature stands (20.4 % of total growing stock), including 3.90 million m^3 of conifers. The average stock per hectare of forest land was 298.3 m^3, in mature and over mature stands 431.3 m^3. The annual wood increment in the area was 4.0–5.3 m^3 per hectare (Fig. 2). The

Fig. 2 The productive beech forests (*Fagus sylvatica*) remain in the Ukrainian Carpathians. The height of beech trees can exceed 45 m (photo credit: Marine Elbakidze)

area of forest available for final harvesting (from the second group) amounted to around 33,000 ha with additional 35,410 ha (from the first group) where final harvesting was allowed. On average 1.5 m^3/ha of timber was harvested from the final fellings and 1.7 m^3/ha from intermediate fellings, which corresponded in average 30 % of annual wood increment.

According to the interviews with directors of the state forest enterprises in Skole district, a total of 190,134 m^3 of timber was harvested in 2003, including 85,797 m^3 (45.1 %) from final harvest operations. The volumes of harvested wood have been increasing since 1998 (141,334 m^3) mainly due to increasing amount of timber from intermediate harvest operations; from 57,008 m^3 in 1998 to 104,337 m^3 in 2003. The total clearcut area in 2003 was 1,815 ha and forest regeneration was made on 587 ha. A low level of investments in the forestry sector was the main reason for a low level of regeneration activities after harvesting during the last years.

About 65–70 % of wood harvested in the district was exported as round wood, thus adding only limited value to local community economic development. According to interviews with directors of the state forest enterprises in the Skole district they paid stumpage fee as permanent forest users to the central budget.

The Skole district was actively used for recreational purposes. There were 12 resorts and tourist national level centers, three motels, and 75 small regional level recreational centers. The recreational and tourism activities were connected with forests, and depend ultimately on the stability of forest ecosystems and quality of forest resources. Forests used for recreational activities were mostly under the management of state forest enterprises, which had to invest money for development recreational facilities. The risk for conflicts between forest logging operations and different recreational uses of forests was obvious. The national natural park "Skolivsky Beskydy" could be a main tourist destination, but due to the lack of funds the park administration was unable to efficiently develop infrastructure for tourism.

The ongoing economic transition has caused a decrease in monetary incomes caused by inflation and inefficient economy, unsatisfactory social protection, and

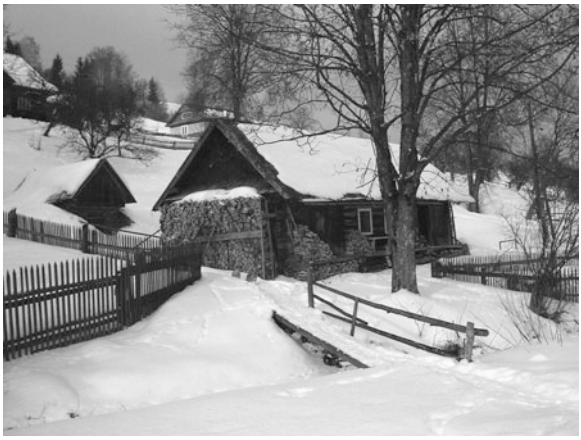

Fig. 3 Forests for building construction and as fuel wood has been important for local people in the Ukrainian Carpathians for centuries (photo credit: Marine Elbakidze)

high level of unemployment. The forest sector in Skole district played therefore an important direct role in the livelihood of local people. The economical crisis during the transition period had made local people's physical survival directly depended on the local use of natural resources. The role of forests as a source of fuel wood and non-wood products for self-subsistence food production has been increased (Elbakidze and Angelstam 2007) (Fig. 3), as well as the illegal exploitation of forest resources (illegal cutting, poaching etc.).

4.3.4 Socio–Cultural Dimensions

Local people have kept their traditional land use practices, which play an important role for the maintenance of cultural landscape biodiversity and rural development. Non-wood forest products (NWFP) such as mushrooms, berries, honey, medicinal herbs, floral greenery, birch sap, resin and wild game are part of the social fabric and livelihood of Ukrainian culture (Bihun 2005; Elbakidze and Angelstam 2007), especially in forest-dependent communities, like the Skole district. The conflict between forest industry and vital interests of local people was due to increase of harvested timber and the conflicting sustainable production of NWFP.

The Skole district has a rich history. The restoration and protection of historic sites of regional and national value have been increasing since 1991, and the Skole district has been recognized as an integral part of Boyko's ethnographic area in the Carpathians (Pavliuk et al. 1996). The support of traditional Boyko's land use, which is closely connected to forests, should be a milestone in a regional program of SFM (Fig. 4).

The privatization of arable and forested land (with restrictions) by local people that began after the collapse of the socialist system, has increased the social and cultural value of forests, which are becoming family's heritage for generations.

Fig. 4 The traditional village system found in the Ukrainian Carpathians is characterized by a centre-periphery zoning from houses, gardens, fields, mowed and grazed grasslands to forests (i.e., the ancient system with domus, hortus, ager, saltus and silva). Village Volosyanka in the Skole district of Ukraine's west Carpathian Mountains illustrates this situation (photo credit: Marine Elbakidze)

This process was of exceptional significance for people in the Western part of Ukraine where the old generation still has feeling of ownership, and memories about political and social events.

5 Discussion

5.1 Evaluation of Obstacles and Gaps

Our analysis of the Skole district case study concurs with previous studies (e.g., Krott et al. 2000), indicating that there are many obstacles in the process of implementing SFM from policy to landscape. This has created different kinds of gaps between the aims of policies and results on the ground.

A first set of obstacles is associated with policy creation and related to the current transition from command and control to market economy approaches in forestry (Raiser 1997; Kallas 2000; Levintanous 2002; World Bank 2002), and other changing values (Mayers and Bass 1999; Kennedy et al. 2001). Altogether this has led to a wide range of challenges in countries in transition (Krott et al. 2000; Pugachevsky et al. 2005).

The primary condition for successful implementation of forest policy and legislation is a functional collaboration among different forest stakeholders representing different societal sectors at different levels (Elbakidze et al. 2010). However, no mechanism for stakeholders' influence on the forest policy have yet been developed. According to the Forest Code (Anon 2006), citizens, their organizations, committee of self-governance have a right to discuss and participate in decision processes concerning use, protection and restoration of forests. However, in the Skole district there were no non-governmental organizations or informal institutions that could realize this right.

These obstacles create a policy creation gap between ecological objectives of forest policy on national level on the one hand, and social–economic needs on regional and local levels on the other. In a forest-dependent district, such as Skole, forests have to satisfy regional, ecological, economic and socio–cultural considerations. Officially, only 3.6 % of total population in Skole area was employed by forest enterprises. However, a much larger proportion of the population was directly and indirectly dependent on the access to fuel wood, building material and non-wood products. Additionally, illegal cutting was a problem. There was no official data about the amount of illegally harvested wood, but it was unofficially estimated that it amounts to 30 % of the officially harvested amount of timber.

A second set of obstacles relate to the policy implementation process. The most important one is the top–down system of policy implementation process. There are overlapping and unclear legal and institutional arrangements between governmental institutions with respect to forest policies (Solberg and Rykowski 2000). As a rule, because authority is assigned from the top to many stakeholders, the functions and responsibilities among them are overlapping and contradictory, which gives a space for unprofessional decisions and corruption (Nijnik and Oskam 2004).

Interviews with local stakeholders in the Skole district, and analyses of statistics allow us to make the following two conclusions. First, the state forest enterprises focus their activity mainly on economic use of forest resources, because they do not get financial support from the government for ecological and socio–cultural activities. Secondly, while the forest legislation and forest programs promote principles of SFM, the local level forest managers do not understand the SFM concept, why it is needed and why it should be used.

The forest enterprises are subject to a range of controlling and demanding organizations, and have few rights and many responsibilities. This system of relations is typical for an administrative system of governance. The income generated by local forest enterprises partly flows to the state budget, which is separated from them by time, space and institutions. Regional industries of manufactured wood products, which give working places for local people and generate income for regional economy, are still in an embryonic state. During Soviet time, the Skole district was a manufacturing centre for wood products drawing wood not only from Ukraine and Russia, but even from Brazil and India. When the forest product industry and forest management were segregated during the reformation of forestry sector in 1995, the manufacturing industry was privatized and then went bankrupt.

To develop SFM the forest enterprises have to introduce new rules. Data from the Skole district shows that the volumes of harvested wood have been growing mainly due to an increase in the amount of intermediate felling. There are different reasons for this. One is poor health condition of forests with large volumes of trees dying from bark beetle (*Ips* spp.) infestation, which is followed by sanitary cuttings. Another reason is a desire to get more income from intermediate felling avoiding payments for commercial wood. At the same time "sanitation cutting" is a carte blanche for clear-cutting practices that implies unregulated cutting under

the guise of forest protection or silvicultural "smoke screen" allowing free reign to forest managers to cut at will (Bihun 2005).

The most economically viable enterprises, for example, the Skole forest enterprise "Skolivskyy derzlishosp" has refused to use budget financing and decided to cover all forest management expenses (plantation, tending, protection against illegal cutting, pests) from wood sale incomes. This is an evidence that forest enterprises could be profitable at least in the most forested areas, in spite of a range of obstacles.

A third set of obstacles for SFM implementation is related to the dominating theoretical and disciplinary scientific approach in forestry. Traditionally, Ukrainian silvicultural science and education were highly advanced. The currently poor economic performance in forestry is largely the consequence of a lack of proper communication, cooperation and reciprocity (Nijnik and Oskam 2004). For example, to improve ecological functions of forest ecosystems in Skole district, which was deteriorated during the course of history, it is necessary to apply contemporary ecological knowledge. However, collaboration between foresters and scientists is ineffective. As a result there is a knowledge gap between needs of interdisciplinary knowledge and holistic approach for SFM implementation, and what is currently applied.

5.2 Bridging the Gaps

Three types of gaps need to be bridged:

1. A policy creation gap between the local level situation and ecological, economic and socio–cultural needs at the national and regional levels.
2. A policy implementation gap between the official definition of SFM, and how its different criteria and objectives are understood by forest actors.
3. A knowledge gap between the need of a holistic transdisciplinary approach for SFM implementation and the present sectoral approach to governance and management of forest landscapes and disciplinary research aimed at supporting implementation of SFM.

While forestry in the traditional sense has a clear positive impact on maintaining forest resources, the impact on ecological and socio–cultural aspects in a local landscape are highly dependent on the economic status and history, and the systems for government and governance. In an increasingly complex and changing world there is a need for initiating relevant innovative research and development to disseminate existing and develop new tools in a toolbox for implementation, and as an interface between practice and policy.

To implement SFM policy in the Carpathian Mountains national forest programs should follow a broad inter-sectoral approach, including the formulation of policies, strategies, and plans of actions as well as their implementation, monitoring, and evaluation. The programs should be implemented in the context of the

socio–economic, cultural, political, and environmental situation and be integrated with wider programs for sustainable land-use and with the activities of other sectors (Nilsson 2002).

As a country in transition, it is important to evaluate the heritage in forestry in Ukraine from the previous political systems to understand what should be changed or remain under the new political and economic conditions. The debate concerning the "socialist heritage" in Ukrainian forest management shows that it should be critically analyzed based on empirical studies for the future development of forestry. For example, according to Polyakov and Sydor (2006), the Ukrainian forestry during the Soviet time (especially in the second half of the twentieth century) "could be judged as a sustainable". They concluded that "Ukrainian forest management under a socialist centrally planned economy did a good job in providing environmental benefits from the forests to the citizens, as well as in preserving and multiplying forest resources". Some features of the Ukrainian forestry like "longstanding sound plantation policies and sound methods" which were implemented under socialism rule, "constitute positive heritage and need to be maintained in order to succeed in the transition to a market economy". Nijnik and Van Kooten (2006) presented an opposite view. They argued that under the command-control economy "the forest resources were excessively exploited and that inadequate attention was paid to silvicultural investments, despite official rhetoric to the contrary". However, in none of these studies neither was the large regional variation in Ukraine considered (Synyakevych and Soloviy 2002), nor was data describing local level indicators for different dimensions of SFM presented for different regions. To resolve this debate we argue that empirical research be made at multiple levels tracking the policy cycle from policy-making to actual forest landscapes and back again (Nilsson 2005). This approach should then be applied in a suite of regions representing different phases in the development of SFM, as well as different economic histories and governance legacies.

Focusing on the local level in the Skole district, this study indicates that there are poor working connections between managers from different sectors: forest management units, a national park, recreational zones and local villages. However, there are no real contacts between representatives for developing a common vision on local and regional development. Thus, even if forest programs are sufficient in a narrow sectoral context, they are not in a broader landscape context.

There are several ways of bridging these gaps. First, introduction of arenas for good governance which could provides a forum for involvement of a variety of stakeholders ranging from the land managers, the general public, and policy makers. Second, dividing land into different zones could help fulfilling economic, ecological and socio–cultural dimension of SFM. In Ukraine a zoning approach for forest development on regional and local level is implemented by dividing forests into four categories. However, in Eastern Europe, including Ukraine, foresters and geographers generally developed zoning concepts, and socio–cultural issues were not considered. Because there are different kinds of forests with different dynamics (Angelstam and Kuuluvainen 2004) and socio–cultural values, different kinds of zoning (Innes and Nitschke 2005) and subsequent management approaches are

needed to maintain all kind of forest values (Fries et al. 1997). Third, to implement concepts for integrated natural resource management concepts such as Model Forest could be employed (Besseau et al. 2002). This represents a way of establishing a societal arena for a partnership among individuals and organizations sharing the common vision of SFM.

Acknowledgments This paper was initially developed as an outcome of the COST action E25 (European network for long-term forest ecosystem and landscape research). We are grateful for the support provided through Folke Andersson to take part in this network. Financial support was provided to Per Angelstam from "Stiftelsen Marcus och Amalia Wallenbergs Minnesfond". Robert Axelsson, Marius Lazdinis, Maria Nijnik and Camilla Sandström provided valuable comments on the manuscript. Special thanks to Maksym Polyakov and Tim Sidor for their constructive comments and edits of the manuscript.

References

Angelstam P, Mikusinski G, Rönnbäck B-I, Östman A, Lazdinis M, Roberge J-M, Arnberg W, Olsson J (2003) Two-dimensional gap analysis: a tool for efficient conservation planning and biodiversity policy implementation. Ambio 33(8):527–534

Angelstam P, Dönz-Breuss M, Roberge J-M (eds) (2004a) Targets and tools for the maintenance of forest biodiversity. Ecol Bull 51:427–454

Angelstam P, Kuuluvainen T (2004) Boreal forest disturbance regimes, successional dynamics and landscape structures—a European perspective. Ecol Bull 51:117–136

Angelstam P, Roberge J-M, Lõhmus A, Bergmanis M, Brazaitis G, Dönz-Breuss M, Edenius L, Kosinski Z, Kurlavicius P, Lārmanis V, Lūkins M, Mikusinski G, Račinskis E, Strazds M, Tryjanowski P (2004b) Habitat modelling as a tool for landscape-scale conservation—a review of parameters for focal forest birds. Ecol Bull 51:427–453

Angelstam P, Kapylova E, Korn H, Lazdinis M, Sayer JA, Teplyakov V, Törnblom J (2005) Changing forest values in Europe. In: Sayer JA, Maginnis S (eds) Forests in landscapes. Ecosystem approaches to sustainability. Earthscan, London

Angelstam P (2006) Maintaining cultural and natural biodiversity in Europe's economic centre and periphery. In: Agnoletti M (ed) The conservation of cultural landscapes. CAB International, Wallingford

Anon (1983) Boikivshchyna, istoryko-etnografichne doslidzhennia. Naukova dumka, Kiev

Anon (2003a) Litopys pryrody natsyonalnogo pryrodnogo parku Skolivsky Beskydy. Unpublished manuscript

Anon (2003b) Carpathian convention: framework convention on the protection and sustainable use of the Carpathians. http://mail.menr.gov.ua/publ/bernconven/docum/index.html. Accessed 20 Oct 2010

Anon (2004) Statystichnyy dovidnyk po L'vivs'kiy oblasti. Naukova dumka, Lviv

Anon (2006) Lisovyi kodeks Ykrainy. http://zakon2.rada.gov.ua/laws/show/3852-12. Accessed 10 May 2010

Anon (2009) Programa Lisy Ykrainy 2010–2015. http://www.lesovod.org.ua/node/4663. Accessed 30 Sept 2012

Balashenko S, Laevskaya E, Makarova T, Lizgaro V, Shcherbina A, Grigoriev E, Tarasenko V (2005) Review of Dnipro basin biodiversity legislation ensuring public participation and support. Water Qual Res J Can 6:68–82

Besseau P, Dansou K, Johnson F (2002) The international model forest network (IMFN): elements of success. For Chron 78:648–654

Bihun Yu (2005) Principles of SFM in the framework of regional economic development. Vistnyk Lvivs'kogo Universytetu Ser Geogr 32:19–32
Boyle M, Kay J, Pond B (2001) Monitoring in support of policy: an adaptive ecosystem approach. In: Munn T (ed) Encyclopedia of global environmental change. Wiley, London
Buksha I (2004) Forestry sector of Ukraine in transition to market economy. Ukrainian Research Institute of Forestry and Forest Melioration. http://www.unece.org/trade/timber. Accessed 10 March 2011
Clark TW (2002) The policy process. A practical guide for natural resource professionals. Yale University Press, New Haven
Elbakidze M, Angelstam P (2007) Implementing sustainable forest management in Ukraine's Carpathian Mountains: the role of traditional village systems. For Ecol Manag 249:28–38
Elbakidze M, Angelstam P, Sandström C, Axelsson R (2010) Multi-stakeholder collaboration in Russian and Swedish Model Forest initiatives: adaptive governance towards sustainable forest management? Ecol Soc 15(2):14
Fries C, Johansson O, Pettersson B, Simonsson P (1997) Silvicultural models to maintain and restore natural stand structures in Swedish boreal forests. For Ecol Manag 94:89–103
Hajda Y (1998) Turkivshchyna: pryroda i liudy. Ranok, Uzhhorod
Head L (2000) Cultural landscapes and environmental change. Arnold, London/Oxford University Press, New York
Hensiruk S (1964) Lisy Ukrajinskykh Karpat ta jikh vykorystannia. Naukova dumka, Kyiv
Hensiruk S (1992) Lisy. Naukova dumka, Kyiv
Hensiruk S, Nijnik M, Kopiy L (1998) Lisy Zahidnogo regionu Ukrayny. Naukove tovarustvo Shevchenka, Lviv
Higman S, Bass S, Judd N, Mayers J, Nussbaum R (1999) The sustainable forestry handbook. Earthscan Publications Ltd, London
Holubetst M et al (1983) Biogeonotstycheskyy pokrov Beskyd i ego dimanicheskie tendentsii. Naukova dumka, Kiev
Innes JL, Nitschke CR (2005) The application of forest zoning as an alternative to multiple-use forestry. In: Innes JL, Hoen HF, Hickey G (eds) Forestry and environmental change: socioeconomic and political dimensions. Report No. 5 of the IUFRO task force on environmental change. CABI Publishing, Oxfordshire
Kallas A (2000) The Estonia forest sector in transition: institutions at work. Interim Report IR-00-073. International Institute for Applied Systems Analysis, Laxenburg
Kalynovych N, Sytnyk O (2003) Istorija zaselennia Ukrajinskykh Karpat. In: Ekolohichni problemy Karpatskoho regionu. Pr Nauk Tov Shevchenka 9:44–53
Kennedy JJ, Ward TJ, Glueck P (2001) Evolving forestry and rural development: beliefs at midpoint and close of the twentiethth century. For Policy Econ 3:81–95
Kimmins H (1997) Forest ecology. A foundation for sustainable management, 2nd edn. Prentice Hall, Upper Saddle River
Krott M, Tikkanen I, Petrov A, Tunytsya Y, Zheliba Y, Sasse V, Rykowina I, Tunytsya T (2000) Policies for sustainable forestry in Belarus, Russia and Ukraine. Koninlijke Brill NV, Leiden
Levintanous A (2002) Russia—forest policy development and related institutional changes in the transition period. In: Forests and forestry in Central and Eastern European countries. The transition process and challenges ahead. Ministerial Conference for the Protection of Forests in Europe (MCPFE), Vienna
Lindenmayer DB, Franklin JF (2002) Conserving forest biodiversity. A comprehensive multiscaled approach. Island Press, Washington
Manfredo MJ et al (eds) (2004) Society and natural resources. A summary of knowledge. Modern Litho, Jefferson
Mayer H (1984) Wälder Europas. Gustav Fischer Verlag, Stuttgart
Mayers J, Bass S (1999) Policy that works for forests and people. Series overview. International Institute for Environment and Development, London
MCPFE (2003) Documents adopted at the fourth ministerial conference on the protection of forests in Europe, Vienna, 28–30 April 2003

Mikusiński G, Angelstam P (1998) Economic geography, forest distribution and woodpecker diversity in central Europe. Conserv Biol 12:200–208
Mikusinski G, Angelstam P, Sporrong U (2003) Distribution of deciduous stands in villages located in coniferous forest landscapes in Sweden. Ambio 33(8):520–526
MCPFE (1993) Resolution H1General guidelines for the sustainable management of forests in Europe. In: Second ministerial conference on the protection of forests in Europe. Helsinki, Finland, 16–17 June 1993. http://www.mcpfe.org. Accessed 22 Feb 2010
MCPFE (1995) Pan-European criteria and indicators for sustainable forest management. Annex 1 of the Resolution 1, Lisbon. http://www.mcpfe.org. Accessed 22 Feb 2010
MCPFE (2001) Criteria and indicators for sustainable forest management of the MCPFE. International expert meeting on monitoring, assessment and reporting on the progress towards Sustainable Forest Management. Yokohama, Japan, 5–8 November 2001. http://www.mcpfe.org. Accessed 22 Feb 2010
MCPFE (2007) Fifth ministerial conference on the protection of forests in Europe. In: Conference proceedings. Warsaw, Poland, 5–7 November 2007. http://www.mcpfe.org. Accessed 22 Feb 2010
Nijnik M, Oskam A (2004) Governance in Ukrainian forestry: trends, impacts and remedies. Agric Res Gov Ecol 3:116–133
Nijnik M, van Kooten CG (2006) Forestry in the Ukraine: the road ahead? Reply. For Policy Econ 8(1):6–9
Nilsson S (2002) Scenarios and forest policy responses. In: IUFRO symposium "Forest research—challenges and concepts in a changing world", Occasional Paper, 16
Nilsson S (2005) Experiences of policy reforms of the forest sector in transition and other countries. For Policy Econ 7:831–847
Opelz M (2004) Towards a Carpathian Network of protected areas. Final report. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Berlin
Pavliuk S (ed) (1996) Skolivshchina. Institute of Regional Studies, Lviv
Peterken G (1996) Natural woodland: ecology and conservation in northern temperate regions. Cambridge University Press, Cambridge
Polyakov M, Sydor T (2006) Forestry in the Ukraine: the road ahead? Comment. For Policy Econ 8(1):1–5
Popkov M, Polyakova L, Storozuk V, Kyryluk S (2001) Osnovnye resultaty i tendentsii raszitiya lesnogo sectora Ukrainy v 1991–2000. Ukrainian–Sweden Project, Kiev
Portenko K (1958) Pozvonochnye Karpat. Nauchnaya mysl, Moscow
Pugachevsky A, Tkach V, Smirnov S (2005) Analysis of forestry use and management practices in the context of landscape and biodiversity protection in the Dnipro Basin. Water Qual Res J Can 6:54–67
Raiser M (1997) Informal institutions, social capital and economic transition: reflections on a neglected dimension. Working Paper 25, European Bank for Reconstruction and Development, London
Rametsteiner E, Mayer P (2004) SFM and Pan-European forest policy. Ecol Bull 51:51–57
Salim E, Ullsten O (1999) Our forests, our future. Report of the world commission on forests and sustainable development. Cambridge University Press, Cambridge
Solberg B, Rykowski K (2000) Institutional and legal framework for forest policies in the ECA region and selected OECD countries—a comparative analysis. Forest policy review and strategy development: analytical studies/issues paper. The World Bank, Washington
Synyakevych I, Soloviy I (2002) Modern forest policy problems in changing society. In: Scientific papers of agricultural university of Poznan. Forestry 5:87–95
Synyakevych I (2004) Ecologichna i lisova polityka. ZUKTS, Lviv
Synyakevych I (2005) Lisova polityka. ZUKTS, Lviv
Szaro R, Angelstam P, Sheil D (2005) Information needs for ecosystem forestry. In: Sayer JA, Maginnis S (eds) Forests in landscapes. Ecosystem approaches to sustainability. Earthscan, London

Trokhimchuk S (1968) Zmina landshaftiv Stryjsko-Sanskoji Verkhovyny v Ukrajinskykh Karpatakh za istorychnyj chas. Rukopys dysertatsiji, Lviv

Turnock D (2002) Ecoregion-based conservation in the Carpathians and the land-use implications. Land Use Policy 19:47–63

Uhnovskyy I (2003) Lisove gospodarstvo v Ukrayni: strategia rozvytku. Mizsvidomcha rada z pytan' rozbytku prodyktyvnyh syl, Kiev

Webster R, Holt S, Avis C (eds) (2001) The status of the Carpathians. A report developed as a part of the Carpathian Ecoregion Initiative. WWF, Vienna

World Bank (2002) Transition. The first ten years. Analysis and lessons for Eastern Europe and the Former Soviet Union. The World Bank, Washington

Zibtsev S, Kaletnik M, Savuschik M (2004) Forests and forestry of Ukraine in the transition period. In: Proceedings of the FAO/Austria expert meeting on environmentally sound forest operations for country. http://dklg.kmu.gov.ua. Accessed 29 May 2011