Forests and Forestry in three Eastern European Countries 15

Per Angelstam and Marine Elbakidze
Swedish University of Agricultural Sciences, Skinnskatteberg, Sweden
Valery Tikhomirov
Belarusian State University, Minsk, Belarus

Russian Federation

Basic Information about the Forests

Globally, the Russian Federation has the richest forest resources in the world. Russia's forest cover ranks number one, with around 886.5 million hectares (or 23% of the global forest area) (Hansen et al., 2010). It is in second place in terms of growing wood stock, with a total of 80.7 billion m³, which amounts to 55% of the world's growing stock of coniferous species. In terms of total carbon stock in forests (185.9 billion tonnes), Russian ranks number one. The forest landscapes in Russia play a major role for the conservation of unique biodiversity and in stabilising the global climate through carbon sequestration (World Bank, 2004). Much of the forest is located in remote areas with slow biological growth and fragile environments, especially in the north and far east.

There are different forest zones in the Russian Federation, from forest tundra and boreal to forest steppe. The main forest tree species are larch (*Larix* spp.) pine (*Pinus* spp.), spruce (*Picea* spp., *Abies* spp.) birch (*Betula* spp.) and aspen (*Populus tremula*) in the north and in the mountains, and oak (*Quercus* spp.) and beech (*Fagus* spp.) in the south. The coniferous forest species cover more than 80% of forested area and more than half of the forested areas are situated in regions with permafrost.

The forest cover has been decreasing continually during the last 500 years, with the most drastic changes happening during the 20th century. However, at the end of the 20th century (1983-2006) the forest cover increased by 6 million hectares (http://rainforests.mongabay.com/deforestation/2000/Russian_Federation.htm).

Brief History of Forest Use

Until the 12th century the use of the forests and forest lands in contemporary Russia was not regulated and forest wood resources were abundant. The development of forests as property with different ownerships began in the form of certain restrictions on forest uses, such as to support bee-keeping and hunting. The right to put boundary-marks on rocks, trees and trunks to delimit different forest holdings appeared for the first time in the 11th century (Hensiruk, 1964 ; Hensiruk et al., 1968). In many regions of Russia the forests were cleared for agriculture development. The people held the land in common, and those who did not belong to the village society did not receive a share of the land. Products from the forests were only used for self-subsistence and people did not pay taxes for this use. Hence, the forests were not considered important property (Teplyakov et al., 1998).

From the 13th to the late 16th century, forest property rights were given to patrimonial estates in some regions

in Russia. One of the reasons was that wood became a subject of trade between different regions due to the development of the sawmill industry and charcoal production. This created an opportunity to transfer forest land as an inheritance or to other persons, as formulated through appropriate legal acts (service, protective, negotiated, inherited and others) (Teplyakov et al., 1998).

The first Russian Forest Code was adopted in 1649. The Code gave final judicial clarification concerning forest ownership with the following property divisions: landlord forests, royal family forests, state forests, state servants' forests, preserved forests, and border forests (Teplyakov et al., 1998).

One of the first laws on forest protection was issued in the 17th century. According to this law, it was prohibited to carry out logging and hunting along the big rivers and along the country's borders. Use of all forest land should be according to the needs and interests of the state. The main requirements were that (1) the logging of timber for ship-building was strictly prohibited, (2) all important trees, e.g. oak, had special signs, and local priests in the churches had to explain the restrictions on using such trees to the local people, (3) it was prohibited to use trees suitable for the building of churches or palaces as firewood, (4) the use of a saw instead of an axe for logging was prohibited; (5) making potash from the felling debris was prohibited; (6) harvesting peat for heating was prohibited (Hensiruk, 1964, 1992).

From the 18th century only state forests were regulated, and the private owners were allowed to use their forest property according to their own will. Rights to use forest products and charges for the use of wood from the state forests were introduced. Forestry thus developed into a separate societal sector with strict rules concerning the use of forest resources. Norms for logging, forest regeneration and forest plantation were defined, and forest administrations were established. Most of the forests belonged to the state (Hensiruk, 1964, 1992; Hrushevsky, 1995). The first record about sustained yield forestry was noted in a law from 18th century, adopted under Catherine II. It stated that: 'commercial and state interests demand that the future abundance of the forests be insured by a precise relationship between harvesting and reforestation' (Teplyakov et al., 1998). The first legislative acts concerning forest protection with the aim of controlling logging were introduced in 1888. These two laws aimed at establishing control over forest use on both state and private land.

During the Soviet era, all forests and forestry activities belonged to the state. The role of forestry was to support industry by supplying cheap raw material. Very limited silvicultural and ecological considerations were taken (e.g. Elbakidze et al., 2007). This exploitative approach led to large areas of clear-cut and young forests dominated by deciduous trees. Originally the forest administration was represented by the state forest management units (*leskhoz*), which were responsible for forest management, protection and conservation. In the 1970s integrated management units (*lespromkhoz*) were established to combine forestry and industry functions. In general, due to limited regulation and control, forest wood resources deteriorated further (Pipponen, 1999).

At the same time, the Soviet system for biodiversity conservation was in many ways successful. The system of strictly protected areas (*zapovedniks*) was developed from the 1930s (Boreyko, 1995; Weiner, 1999). Zoning of forest landscapes to satisfy protective, nature conservation and social functions was developed already in the 19th century. In April 1943 forests were divided into three groups where 'forests with protective and social functions' belonged to the first group. The second group included forests with ecological functions and certain limitations for exploitation, and forests available for exploitation belonged to the third group (Teplyakov et al., 1998). The areas set aside were substantial. For example in the Troitsko-Pechorsk region (4,100 km^2) in SE Komi Republic, a total of 40% was set aside for nature conservation and social functions (Angelstam et al., 1997, 2004).

Forestry at Present

Since 1991, after the disintegration of the Soviet Union, the development of the forest sector in the Russian Federation as an independent state has been in a state of flux and turmoil. The transition period from a socialistic planned economy to a market economy has been accompanied by economic and political crises. New Russian forest legislation has been discussed in terms of how to: (1) create and adopt market relations in the forest sector; (2) divide rights and responsibilities between federal and regional authorities; (3) divide tasks between public

forest management and private forest industry; and (4) determine forest ownership.

During recent decades, revised Forest Codes have been adopted four times – in 1993, 1997, 2001 and 2007. The first Forest Code (1993) was inherited from the Soviet time, and was not appropriate for the transition towards a market economy. The main arguments for reforming the forest sector in Russia stated at political level were: (a) only 20% of forest wood resources were used by the commercial forestry sector; (b) as an owner of forests in Russia the state was ineffective under market conditions; and (c) improving the forestry sector would be possible only through radical transformation of the system of governance.

Following the Forest Code of 1997, forest management was divided between the federal and regional levels. The regional level decided on the level of revenues from forest use, and the federal level by and large accounted for the costs. On average the costs for management, protection and conservation were twice those of the revenues from forest use. As a result, state forest management units were forced to carry out commercial intermediate cuttings to cover the costs. The Forest Code of 2001 had the main goal of radically improving the economic situation in the forest sector to gain more economic benefits from Russia's natural resources.

The present Forest Code (2007) has a number of key strategic goals: to establish a new balance of power between Federation, Subjects of Federation and Private Business; to separate forest management and forest administration; and to establish a competitive and market-orientated environment in the forestry sector, including forest management.

At present the centralised system of governance in the forest sector has been replaced by a de-centralised system (e.g., Nilsson and Shvidenko 1998, Carlsson et al. 2001, Krott et al. 2000; Levintanous 1992; Solberg and Rykowski 2000). The most fundamental changes in the forestry sector since 2007 are:

1 The responsibility (power) over forests has been moved from the Federal level to the Subjects of the Federation (e.g., Republic, oblast etc.).
2 New institutions have been established for forest administration on the federal and regional levels. The Ministry of Agriculture is responsible for the forest policy and law making functions. The Federal Forestry Agency delegates decision making functions to the regions and is responsible only for forest policy implementation. At the local level, there has been a radical reform of forest management. The local state forest management units supervise how forests are used and are free from any commercial activity. New state forest enterprises have been established for commercial activities.
3 A new relationship between the state and private business has developed. Private business is responsible for the forest industries, silvicultural activities and forest protection.
4 Abolition of the system with three groups representing protective functions (group 1), multiple use (group 2) and industrial use (group 3).

The condition of forests and the potential for development of the forest industry are very diverse in Russia due to the large differences among regions in their natural biophysical conditions and history of forest use. The European part of the different forest zones is being gradually transformed by its economic utilisation (Angelstam and Törnblom, 2004; Angelstam and Kuuluvainen, 2004; Angelstam et. 2005; Shorohova and Tetioukhin, 2004; Volkov and Gromtsev, 2004). The official harvest statistics describing the historical development of wood harvest in the Russian Federation's Komi Republic is illustrative (Figure 15.1). The history of local forest use in Komi is

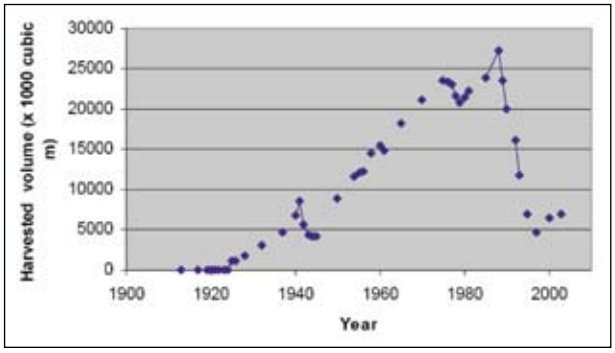

Figure 15.1. Graph showing the annual harvest of wood in the Komi Republic in the Russian Federation during the past 100 years. Source: Compilation of official forest statistics in the Komi Republic.

ancient. Logging for export of wood was long confined to high grading close to rivers of large valuable trees used for ship-building. While local forest industries supporting mining and salt boiling occurred early on, industrial forestry commenced only after WW2. Logged volumes increased from 5 million m^3 annually before WW2 to more than 25 million m^3 in 1990. This was again followed by a reduction to 6 million m^3 annually, a 75% decline (Figure 15.1).

Figure 15.2. Naturally dynamic pine forest in a remote area of the Murmansk Region in north-west Russia (2007). Photo: Marine Elbakidze.

The former system of forest groups, with group 1 forests satisfying different protective functions such as buffer zones along streams, roads and villages, resulted in an active zoning of landscapes into different functions. Therefore, at the local level, forest landscapes in north-west Russia have abundant forest resources, either because the some older forests have not yet been harvested, for example in remote parts of the Komi Republic, Arkhangelsk or Murmansk regions, or because the forest has recovered by natural succession after intensive logging in the early twentieth century (Figure 15.2). However, at other places they have probably been subjected to more recent unsustainable exploitation, also known as wood mining or cut and run practices, with very limited wood resources left, and the logging camps and villages deserted, or with very limited potential for the near future (e.g. Knize and Romanuk, 2005). In the light of these changes, as noted by Lehtinen (2004): 'the forest actors of the European North need to carefully examine the new signals in forest trade, emerging from green developmentalism and new tourism entrepreneurship'.

The Kovdozersky state forest management unit (400,000 ha) in the southern Murmansk region provides a good illustration of the economic and socio-cultural challenges (Elbakidze et al., 2007). During the Soviet period forestry was the main industry in the area. The harvesting activity was very intensive during this period, and annual allowable cuts were often exceeded. The amount of forest harvested peaked at 596,600 m^3 in 1955. Since 1991 the harvest has not exceeded 10,000 m^3. As a consequence of previous forest exploitation (often referred to as 'forest mining'), young and middle-aged forests dominate in the area (Figure 15.3). It is important to note that in this region, and in general in NW Russia, only stands older than about 120 years are harvested. At present, the local and regional forest industry has virtually disappeared. The annual allowable cut is 55,400 m^3, and only 10% of this was harvested in 2004 and 2005 (Elbakidze et al., 2007).

During the past decade state investment in the forest management has been very low, which was the main rea-

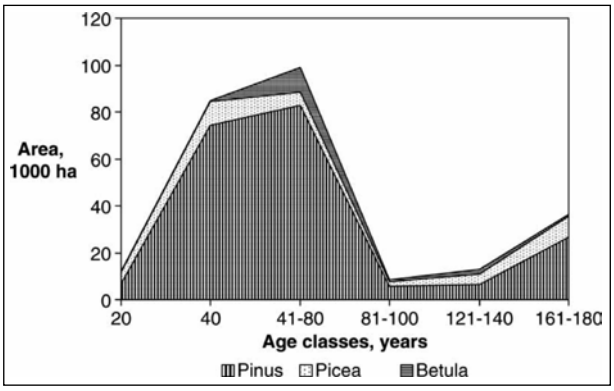

Figure 15.3. The area of main tree species in the Kovdozersky state forest management unit in the Murmansk region of north-west Russia Source: Archives of the Kovdozersky leshoz. Zelenoborskyy, Murmansk oblast.

Table 15.1. Summary of silvicultural system development in the Kovdozersky state forest enterprise (leskhoz) (Murmansk region, Russian Federation) (Elbakidze et al., 2007).

Kovdozerskiy leskhoz (total area is around 500,000 hectares) (Murmansk region, the Russian Federation)	
Final harvest: • log	Mainly by assortments and seldom by tree-length logs
• pulpwood	30% of pulpwood after final felling
• branches	Left in the forest after final felling
• stumps	Left in the clear cuts after final felling
Intermediate harvest • Sanitary cuttings	The total area of sanitary cuts is up to 0.01% of total leskhoz's area per year. At present sanitary cuttings are made mainly after windfall
• Commercial thinning	The first time is in the young forests (aged up to 40 years). Only 5% of the area which should be done is actually treated. The second time at a stand age of 40-60 years. This is done in only 1% of the area where it should be done. After the second commercial thinning there is 30% saw-wood and 70% pulpwood
Regeneration • Seed trees/scarify	The last time this was done was in 1998 on big clear cuts (more than 200 ha)
• Plantation	Forest plantation was carried out on an area of 0.01% of total leskhoz's area in 2005
• Leave undergrowth	Undergrowth is left after final felling if the size of clear cuts is more than 100 ha
Means of intensification • Draining	No
• Nitrogen fertilisation	Not at present. It was stopped 15 years ago
• Other fertilisation	No
• Genetic/selection	Selection work to improve the quality of tree species
• Exotic species	Cembra pine and Larix were introduced

son for the poor forest management in many local state forest enterprises. Many of them had to reduce or stop some silvicultural activities due to lack of finance. The Kovdozersky local state forest enterprise is an example (Table 15.1). Unlike previously, according to the Forest Code (2007), forest leasers are responsible for forest management.

In general, the Russian forest sector is now at a stage of integration into international markets. In 2002, timber harvest was about 180 million m^3 and the export value was about $4.5 billion. Increased commercial value and volumes logged can be expected, based on continued increases in domestic and international demand for forest products. Domestic forest product consumption is estimated to grow from 80 million m^3 of roundwood equivalent in 1994 to about 125-165 million m^3 by 2010 (World Bank, 2004). Overall market prospects are positive. The main aim now is to shift production from exporting raw wood and basic commodities to higher value-added products. However, improved forest road systems and other transport infrastructure, training, favourable legal and policy framework and overall improvement of the business climate are needed, which requires considerable new investments in sector modernisation (World Bank, 2004).

Ukraine

Basic Information About the Forests

Ukraine was part of the Soviet Union until its independence in 1991. Next to Russia, Ukraine is the largest

European country, covering 603,548 km^2. The forested area in Ukraine is 9.4 million ha, or 15.6% of the total land area.

Forests range from mixed hemiboreal and broadleaf forests in the north to steppe-forest woodland in the south. The forests in the Carpathian Mountains range from temperate to mixed forests with a boreal character close to the tree line (Figure 15.4). Forests in the Crimean mountains range from Mediterranean shrub to broad-leaved and coniferous forests (Hensiruk, 1992).

Figure 15.4. The Carpathian Mountains in the Western Ukraine are one of the most forested regions. Photo: Marine Elbakidze.

As a result of climatic conditions and anthropogenic influence during historic time, forests are very unevenly distributed in Ukraine (Buksha, 2004). The forest cover in different regions varies from 3.8% in the steppe zone to 70% in the Carpathian Mountains. The majority of forests are concentrated in the northern and the western parts of Ukraine. The largest forest cover is found in the Carpathian Mountains (40%), Polissya (29%) and Crimea (26%). By contrast, the forest cover is lower, and includes forest plantations, in the forest-steppe (8%) and steppe (3%) zones. Conifers occupy 42.6% of the forested area, with pine trees accounting for 36% of this figure. Deciduous forests cover 57.4% of the total area, with beech (*Fagus sylvatica*) and oak (*Quercus robur*) comprising 33% of this figure (Nilsson and Shvidenko, 1999).

More than half of Ukraine's forests (55.8%) are classified as protective and protected forests. Thus, forest management is restricted, for certain categories of forests final fellings are not allowed or rotation ages are much longer than in commercial forests. Other forests, mainly used for wood production, are classified as commercial forests (Forest Code of Ukraine, 2006). The area of the protective and protected forests has been increasing since 1991 due to the creation of new protected areas.

Massive forest fellings took place during World War II, and subsequent intensive forest planting occurred. Today, commercial forests aged up to 20 years comprise 31% of the total forest area, from 20-40 years ~45%, from 40-60 years ~13% and older than 60 years ~11% (Shvidenko and Andrusishin, 1998; Hensiruk et al., 1995). Currently, about 15 million m^3 of timber is harvested in Ukraine per year. Each year, enterprises of the State Forestry Committee of Ukraine cut and sell more than 7.6 million m^3 of wood, of which 5 million m^3 is industrial wood.

The Ukrainian forests are characterised by high productivity (Figure 15.5). The annual total average increment is 4.0 m^3/ha. The annual total increment varies from 5.0 m^3/ha in the Carpathian Mountains to 2.5 m^3/ha in the steppe zone. The total growing stock on forested areas is 1.74 billion m^3 (Nilsson and Shvidenko, 1999). The average wood stock is 185 m^3/ha.

Brief History of Forest Use

The forest landscapes in Ukraine remained more or less natural in terms of tree species composition until the 15th century. The forest was used by local people for hunting, bee-keeping, collecting non-wood products and was cut down only for agricultural purposes. From the 16th century forest usage became economically profitable. The forest areas began to decrease due to anthropogenic activity and their species composition and qualitative structure was altered (Hensiruk, 1992; Kubiyovych, 1938).

Figure 15.5. Productive beech forests (Fagus silvatica) remain in the Ukrainian Carpathians. The height of these beech trees is more than 45 metres. Photo by Marine Elbakidze.

Figure 15.6. Bark-beetles (Ips spp.) are one of the main 'destroyers' of introduced Norway spruce forests in the Ukrainian Carpathians. Tracks of bark-beetle larvae in the bark of Norway spruce. Photo by Marine Elbakidze.

In Ukraine commercial forest exploitation began in the 18th century, and along with railway building the forest industry started to alter forest landscapes completely. The wood was exported to Germany, France, England and Poland. Focusing on sustained yield production of wood, monocultures of Norway spruce (*Picea abies*) were created in the Carpathians and Scots pine (*Pinus silvestris*) in Polissya. In addition, wood was intensively used for potash production and as a source of energy for iron and glass manufacturing and sugarbeet processing. Forest cutting led to reduction in the proportion and area of beech and mixed spruce-beech-fir forest areas in the Carpathian Mountains, and a strong decline and regional disappearance of beech and oak (*Quercus* spp.) forests in central and north-western parts of Ukraine (Hensiruk, 1992; Hensiruk et al., 1995 ; Holubetst and Odynak, 1983; Holubetst et al., 1988; Kalynovych and Sytnyk 2003; Krynytskyj and Tretiak 2003).

In eastern Ukraine, agriculture's role became more significant due to the increased demand for bread in western European countries in the 18-19th centuries. In fact, until 1914 Ukraine was the European continent's leading exporter of grain (Davies, 1996). The need for new agricultural land caused a disastrous reduction in forest areas in the forest-steppe region. The area of forests in this zone was diminished to a fourth (Hensiruk et al., 1995). Some forest restoration started in the middle of the 19th century on small areas in steppe and forest-steppe zones of Ukraine, as well as in the Carpathian Mountains (Vakaluk, 1971).

The first legislative acts concerning forest protection with the aim of controlling logging were compiled only in the second part of the 19th century. In western Ukraine, a forest protection law was passed in 1852 and in the Russian-governed part of Ukraine in 1888. These were the first large-scale attempts at forest restoration in the Carpathian Mountains and at creating forest protection strips in steppe regions to mitigate wind erosion.

Data about the condition of forests in Ukraine during the Soviet period are contradictory. According to official information, forest area increased gradually. For instance, from 1961 to 1988 the forest area in Ukraine increased by 20.9% (Hensiruk et al., 1995) and from 1988 to 1996 by 1.2% (Forestry in Ukraine: the Strategy of Development, 2003). At the same time, in the Carpathian region of Ukraine monocultures of coniferous even-aged stands were created, which are characterised by low ecological stability (Hensiruk et al., 1995). As a consequence, the area of forests damaged by insects, fires and windfalls has increased during recent years (Hensiruk, 1992) (Figure 11.6). Due to the

Figure 15.7. Logging operations on steep slopes without any ecological considerations are still being conducted in the Ukrainian Carpathians. Photo: Marine Elbakidze.

Chernobyl accident in 1986, a large part of Polissya's forests in northern Ukraine became contaminated with radioactivity. Around 3.5 million ha (37%) of forest area were affected, of which 157,000 ha (1.6%) now have no potential for use due to radioactive contamination (Buksha, 2004; Nilsson and Shvidenko, 1999). The large-scale drainage of Polissya's wetlands in northern Ukraine decreased groundwater levels and caused forest drying.

Forestry at Present

Forests in Ukraine are state property. However, according to the new Forest Code (2006) communities and private people are able to own forests with some limitations. The forest lands are under the management of different state organisations including the state forestry committee (66%), and the ministries of agriculture (26.4%), defence (2.2%), emergency (1.6%), transport (1%), ecology and natural resources (0.8%) (Forestry in Ukraine: the Strategy of Development, 2003).

The forest industry is still a minor economic sector amounting to 0.2-0.4% of GDP. In budgetary terms, forestry expenses are twice the revenues from forest resources use (Forestry in Ukraine: the Strategy of Development, 2003; Synyakevych and Soloviy 2002). Payment for forest resources exploitation remains very low. The state as an owner of forest resources earns on average 3.9 hrn (€0.6) per cubic metre of logged merchantable timber. This is significantly less than in other countries (Forestry in Ukraine: the Strategy of Development, 2003).

As a country in transition it is very important to evaluate the heritage in forestry from the previous political systems for understanding 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 analysed for the future development of forestry. There are opinions that the Ukrainian forestry during the Soviet time (especially in the second half of the 20th century) 'could be judged as sustainable' (Polyakov and Sydor, 2006). The main proponents of such opinions argue that the 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 (Polyakov and Sydor, 2006). Their opponents presented an opposite view (Nijnik and Van Kooten, 2006). 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.

Today the principles of Sustainable Forest Management (SFM) have been adopted into the national legislation and forest programmes. The main trend of 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 (2006), the Law on the Environmental Protection of Ukraine (1991), and other legislative documents and governmental regulations that play a fundamental role in developing environmentally sound forest operations.

The Ukrainian Forest Code 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 (Forest Code of Ukraine, 2006). According to the political and legislative documents the main goals of forestry in Ukraine are to: (1) conserve biological diversity in forests; (2) extend forest-covered territory to an optimal level in all natural zones; (3) protect forest function and

Figure 15.8. The traditional village system found in Europe's forest and woodland landscapes is characterised 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). This view of the village Volosyanka in the Skole district of Ukraine's west Carpathian Mountains illustrates this. Beginning in the left part of the picture, the church in the very village centre is surrounded by houses that are located in the bottom of the shallow valley. The private gardens have many fruit trees and shrubs. Further to the right there is a fine-grained mixture of grasslands, some individual fields of which has been mowed and have hay-stacks and some not yet, and fields, like the potato field in the foreground. To the right there is forest, which is grazed by cattle moving in and out along specially designed fenced trails from the farm houses in the valley bottom. In addition, above the tree line on the top of the mountains, there are open grazed pasture commons. Photo: Per Angelstam.

limit forest exploitation; (4) improve social protection of forestry workers; (5) increase the resistance of forest ecosystems to negative environmental conditions; (6) improve forest management legislation according to international principles of SFM; and (7) encourage the development of forest research and education (Forest Code of Ukraine, 2006; Zibtsev et al., 2004; Buksha, 2004; Hensiruk, 1992 ; Essmann and Pettenella, 2001; Polyakova et al., 2001).

During recent decades the forest landscapes have been under severe threat from unsustainable logging methods, past replacement of natural tree species with introduced Norway spruce, habitat loss and fragmentation due to intensified forestry and infrastructure development (Hensiruk, 1964; Trokhimchuk, 1968 ; Holubetst and Odynak, 1983) (Figure 15.7). On the other hand, due to economic reasons and the need to develop local livelihoods, local people have had to come back to their traditional land use practices of the village system (Elbakidze and Angelstam, 2007 ; Bihun 2005). These were commonly practised for centuries, before the socialist period, and played an important role for maintenance of biodiversity and cultural heritage, and thus for rural development in Ukraine and Europe (e.g. Mellor and Smith, 1979). The recent privatisation of land has led to a revival in the social and cultural value of forests in Ukraine, which were often an unbroken part of families' cultural and natural heritage for generations (Elbakidze and Angelstam, 2007) (Figure 15.8).

There are, however, several opinions about the role of Ukrainian forests today and in the future. The first is ecologically orientated, and declares that the forest sector in Ukraine does not have economic importance. Instead forests play a profound ecological function, and should therefore be appropriately protected and harvesting practices should be reduced (Listopad, 2000). The second is economically orientated. The main thesis here is that exploitation and forest management and harvesting intensity in Ukraine are lower than in most European countries. Thus, forest sector utilisation has to increase substantially to fulfil economic needs at national, regional and local level (Bobko, 2003). Finally, a third view is that forests have ecological as well as economic and social functions (Polyakova et al., 2001; Synyakevych, 2004, 2005). Implementation of SFM according to the international discourse will help to combine these dimensions in the forested landscape (Essmann and Pettenella 2001; Krott et al. 2000).

Belarus

Basic Information About the Forests

Belarus is located in the transition between the southernmost boreal forest and the temperate forest zone and is thus dominated by mixed deciduous and coniferous. The main tree species are Scots pine, Norway spruce and birches. At present 30% of the total area is forested. Young forests constitute 36.6%, middle age 14.2%, and mature and "over mature" 4.8%. The forested area occupies about 8.3 million ha. The total stock of timber is 1.3 billion m^3 (Anon, 2010).

The forests are state owned and a large proportion are managed by the Committee of Forestry (about 7 million ha or 76.1% of the total forested area). The remaining forested land is under the management of the Committee of Defence, collective farms and associations, research institutes and local administrations (Anon, 2010). Depending on their commercial value and their location, the forests are divided into two groups. The first group of forests having water protection, sanitary and other protective functions make up 44%, while the second one, which is of commercial value, constitutes 56% of forests (Anon, 2010). Around 14-15 million m^3 of timber are harvested annually in Belarus, allowing the demand in the domestic market to be fully met, and nearly 2 million m^3 of industrial wood to be exported.

Forest-based Industries

The Republic of Belarus has a developed timber, woodworking and pulp and paper industry, which increased its production 2.8-fold over the period 1991-2005. The timber industry of Belarus has been subject to intensive privatisation: businesses with private and foreign categories of ownership produce over 70 and 6.4% of the total products, respectively, and employ 75 and 5.8% of the total sector's industrial and production potential.

The Belarusian forest industry is export-orientated in terms of numerous types of goods: fibreboard, furniture and plywood, sawn timber, wallpaper, matches, etc. In 1996-2005, the export potential of the forestry increased 4-fold.

Use of Forested Land

In 1955, Belarus had 23% forest land, now it has ~40%. From 1965 to 2000, the annual forest land increase was about 33,800 hectares. In 2001-2006 it increased to 51,900 ha. Nowadays the area forest land is equal to the agricultural area, which is ecologically beneficial for Belarus and all the region.

Table 15.2. Land use changes in Belarus, 2001-2005

Type of lands	2005		+/- compared to 2001	
	x10^3 ha	%	x10^3 ha	%
Farms and other agricultural land	8920.1	43	+9.3	+0.1
State forest land	8299.5	40	+209.0	+2.6
Land for nature protection and recreation	879.2	4.2	+46.5	+5.6
Industrial, transport, and military areas	690.1	3.3	-1211.7	-15.0
Private land	1284.1	6.2	-147.5	-10.3

The increase in forested land in Belarus in the past decade is a result of degraded and low productive agricultural land being converted to forest according to a decision by the Belarusian government. A large amount of land polluted with radionuclides was reforested after 1986. The role of forestry is thus not only production of natural resources, but also rehabilitation of destroyed land. Reforestation in Belarus is also occurring on obsolete military and industrial lands, while unused private land is transferred to other farmers or to forest lands (Table 15.2).

Forest historically has a multifunctional role in the life of Belarusian inhabitants. It is a source of wood for building and energy, herbs for medical purposes and food for domestic animals. There was never starvation in Belarus because when the harvest was bad in farmers' fields, the forest fed people with mushrooms, nuts, berries and the meat of wild animals. Nowadays skill in gathering mushrooms and berries is part of the culture of Belarusian people.

The forest in Belarus has a very important recreation function. Every weekend a lot of people go to the forest to walk, picnic or gather mushrooms and berries, or to hunt in the season.

Norberg, P., Nilsson, A., Westfjord, P., Malmquist, Y. and Rydén, L. 2000. Shipping – boats, harbours and people. In: Lundin, L-C. River Basin Management. Sustainable Water Management, Volume III. pp. 243. Uppsala: Baltic University Press.

Rydén, L., Brinkman, I. and Malmquist, YB. 2000. *Water regulation and water infrastructure*. In: Lundin, L-C. (Ed.) River Basin Management. Sustainable Water Management, Volume III. pp. 243. Uppsala: Baltic University Press.

Rydén, L., Migula, P. and Andersson, M. (Editors). 2003. *Environmental Science – understanding, protecting, and managing the environment in the Baltic Sea region*. pp. 823. Uppsala: Baltic University Press.

Chapter 13

Baltic 21. 2005. *Action plan for the Baltic 21 forest sector 2005-2008*. Baltic 21 Publication Series 1/2005. http://www.baltic21.org/?sasp,6#action (retrieved 20120917).

European Forest Institute (EFI). 2009. *Report of the Mid-term evaluation of the implementation of the EU Forest Action Plan*. Service Contract No. 30-CE-0227729/00-59. Joensuu, Finland. http://ec.europa.eu/agriculture/eval/reports/euforest/synthetic_sum_en.pdf (retrieved 20120917)

Diamond, J. 2005. *Collapse – How societies choose to fail or to succeed*, Viking Penguin, USA.

Food and Agricultural Organisation (FAO). 2005. *Global forest resources assessment 2005. Progress towards sustainable forest management*. FAO Forestry Paper 147. ftp://ftp.fao.org/docrep/fao/008/A0400E/A0400E00.pdf (retrieved 20120917)

Food and Agricultural Organisation (FAO). 2009. *State of the World's forests 2009*. FAO, Rome.

Forest.fi. 2009. *Finnish forests owned by Finns*. http://www.forest.fi/smyforest/foresteng.nsf/allbyid/438DBC6361C9EB75C2256F34004154D8?Opendocument (retrieved 20120917)

Forest.fi. 2006. Forest sector produces and employs. http://www.forest.fi/smyforest/foresteng.nsf/allbyid/197B4F3FC67881E2C225783300415716?OpenDocument (retrieved 20120917)

Grober, U. 1990. *Deep roots: a brief conceptual history of sustainable development* – nachhaltigkeit http://skylla.wzb.eu/pdf/2007/p07-002.pdf (retrieved 20120917)

Lazdinis, M., Carver, A.D., Lazdinis, I. and Paulikas, V.K. 2009. From union to union: forest governance in a post-Soviet political system. In. *Env. Sci. & Policy 12 (2009),* pp. 309-320.

The Ministerial Conference on the Protection of Forests (MCPFE). 2010. *The MCPFE press kit*. http://5th.mcpfe.org/foresteurope.org/filestore/foresteurope/Press_material/FOREST_EUROPE_Press_Kit.pdf (retrieved 20120917)

Olmos et al. 1999. Non-wood forest products: utililzation and income generation in the Czech Republic, Finland and Lithuania. In: Dembner, S.A. and Perlis, A. *Non-wood forest products and income generation*. Unasylva – No. 198. FAO Corporate Document Repository. www.fao.org/DOCREP/X2450E/x2450e07.htm (retrieved 20120917)

Paul, K.I., Polglase, P.J., Nyakuengama, J.G. and Khanna, P.K. 2002. Changes in soil carbon following afforestation. In: *Forest Ecology and Management* 168:241-257.

United Nations (UN). 2007. *Non-legally binding instrument on all types of forests adopted by the UN General Assembly on 22 October 2007*. http://www.un.org/esa/forests/pdf/ERes2007_40E.pdf (retrieved 20120917)

United Nations Economic Commission for Europe (UNECE) and Food and Agricultural Organization of the UN (FAO). 2007. *State of Europe's forests 2007. The MCPFE report on sustainable forest management in Europe*. http://timber.unece.org/fileadmin/DAM/publications/State_of_europes_forests_2007.pdf (retrieved 20120917)

United Nations REDD Programme, http://www.un-redd.org (retrieved 20120917)

Chapter 14

Borealforest. 2009. *Management & Sustainability – Scandinavia*. www.borealforest.org/world/scan_mgmt.htm (retrieved 20120917)

Food and Agricultural Organisation (FAO). 2009. *State of the World's forests 2009*. FAO, Rome.

Lazdinis, M., Carver, A.D., Lazdinis, I. and Paulikas, V.K. 2009. From union to union: forest governance in a post-Soviet political system. In. *Env. Sci. & Policy 12 (2009),* pp. 309-320.

Ministry of Environment (MoE), Poland. 2009. *Fourth national report on the implementation of the Convention on Biological Diversity*. Warsaw, Poland. http://www.cbd.int/doc/world/pl/pl-nr-04-p1-en.pdf (retrieved 20120917)

Perlinge, A. (ed.). 1992. *Skogsbrukets tekniska utveckling under 100 år*. Stockholm: Nordiska museets förlag 119 pp (in Swedish)

Royal Swedish Academy of Agriculture and Forestry (KSLA). 2009. *The Swedish forestry model*. 15 pp. Stockholm

Saastamoinen, O. 1999. Forest policies, access rights and non-wood forest products in northern Europe. In: Dembner, S.A. and Perlis, A. *Non-wood forest products and income generation*. Unasylva – No. 198 . FAO Corporate Document Repository http://www.fao.org/DOCREP/X2450E/x2450e06.htm (retrieved 20120917)

The Swedish Forest Agency, 2009.

The Swedish Forest Industries. 2008. *The Swedish forest industries. Fact and figures 2008*.

UPM Forest AS. 2006. *Baltic states. Strict government regulation allows traceability of all timber*.

United Nations Economic Commission for Europe (UNECE) and Food and Agricultural Organization of the UN (FAO). 2007. *State of Europe's forests 2007. The MCPFE report on sustainable forest management in Europe*. Warsaw.

Chapter 15

Angelstam, P., Kapylova, E., Korn, H., Lazdinis, M., Sayer, J.A., Teplyakov, V. and Törnblom, J. 2005. Changing forest values in Europe. In: Sayer, J.A. and Maginnis, S. (eds.), *Forests in land-*

scapes. Ecosystem approaches to sustainability. Washington D.C.: Earthscan, pp. 59–74.

Angelstam, P., Dönz-Breuss, M., Roberge, J.-M. (eds) 2004. *Targets and tools for the maintenance of forest biodiversity*. Ecological Bulletins 51. 2004

Angelstam, P. and Törnblom, J. 2004. Maintaining forest biodiversity in actual landscapes – European gradients in history and governance systems as a 'landscape lab'. In: Marchetti, M. (eds.), *Monitoring and indicators of forest biodiversity in Europe – from ideas to operationality*. EFI symposium 51, pp. 299–313.

Anon. 2010. *Annual Review of state and usage of Republic Belarus forests in 201*0. Ministry of forestry Republic of Belarus.

Bihun, Yu. 2005. Principles of Sustainable Forest Management in the Framework of Regional Economic Development. In: *Vistnyk Lvivs'kogo unviversytetu. Seria geografichna* 32. pp.19–32.

Bobko, A. 2003. *O neporodoksalnyh putyah putayh sovershenstvovaniya Lesnogo kodeksa Ukrayny*. (in Russian).

Boreyko, V. 1995. *Istoriya zapovednogo dela v Ukraine*. Kiev.

Buksha, Ig. 2004. *Forestry sector of Ukraine in transition to market economy*. Kharkiv: Ukrainian Research Institute of Forestry and Forest Melioration.

Carlsson, L., Lundgren, N.-G. and Olsson, M.-O. 2001. The Russian detour: real transition in a virtual economy. In: *Europe-Asia Studies* 53(6). pp. 841–867.

Davies, N. 1996 . Europe: a history. Oxford: Oxford University Press.

Elbakidze, M. and Angelstam, P. 2007. Implementing sustainable forest management in Ukraine's Carpathian Mountains: The role of traditional village systems. In: *For Ecol Man* 249: 28–38

Elbakidze, M., Angelstam, P., Axelsson, R. 2007. Sustainable forest management as an approach to regional development in the Russian Federation: state and trends in Kovdozersky Model Forest in the Barents region. In: *Scandinavian Journal of Forest Research* 22: 568-581.

Essmann, H.-F. and Pettenella, D. (eds.) 2001. *Forestry in Ukraine at the crossroads. Problems and perspectives for a sustainable development*. Lviv: Afisha. 226 pp.

Hansen, M., Stehman, S. and Potapov, P. 2010. *Quantification of global gross forest cover loss* PNAS 107 (19): 8650-8655.

Hensiruk, S. 1964. *Lisy Ukrajinskykh Karpat ta jikh vykorystannia*. Kyiv: Naukova dumka. (in Ukrainian).

Hensiruk, S. 1992. *Lisy*. Kyiv: Naukova dumka. (in Ukrainian).

Hensiruk, S., Furduchko, O., Bondar, V. 1995. *Istoriya lisivnytstva v Ukrayni*. Svit, Lviv (in Ukrainian)

Holubetst, M. and Odynak, Ya. 1983. Korennoy biogeotsenotsicheskyy pokrov i ego antropogennye ismeneniya. In: Holubetst, M. (Eds.), *Biogeonotstycheskyy pokrov Beskyd i ego dimanicheskie tendentsii*. Kiev: Haykova dumka. pp. 179–182. (in Russian)

Holubetst, M. et al. 1988. *Ukrayns'ky Karpaty*. Kiev: Naukova dumka (in Ukrainian).

Hrushevsky, M., 1995. *Istorija Ukrajiny – Rusi*. Zhyttia ekonomichne, kulturne, natsionalne XIV–XVII vikiv. Kyiv (in Ukrainian).

Knize, A., Romaniuk, B. 2005. *O dvuch tochkakh zreniya na Rossiyskiy les i lesnoye khozyaystvo*. WWF (in Russian).

Krott, M., Tikkanen, I., Petrov, A., Tunytsya, Y., Zheliba, Y., Sasse, V., Rykowina, I. and Tunytsya, T. 2000. *Policies for sustainable forestry in Belarus, Russia and Ukraine*. Leiden: Koninlijke Brill NV.

Kubiyovych, V. 1938 . *Geografiya Ukrainskyh i symizhnyh zemel.* Volume 1. Lviv, Ukrainian Publishing House (in Ukrainian).

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*. Vienna: Ministerial Conference for the Protection of Forests in Europe (MCPFE), Liaison Unit

Listopad, O. 2000. *Lesnoe pravo na Ukraine i vozmozhnosti obzsestvennosti v ohrane lesa*. On: www.forest.ru. (in Russian).

Mellor Smith, A. 1979 . *Europe: a geographical survey of the continent.* Columbia University Press, New York.

Mongabay.com. http://rainforests.mongabay.com/deforestation/2000/Russian_Federation.htm

Nijnik M, van Kooten C.G. 2006. Forestry in the Ukraine: the road ahead? Reply. Forest Policy and Economics 8(1):6–9

Nilsson, S. and Shvidenko, A. 1999. *The Ukrainian forest sector in a global perspective. Interim Report IR-99-011*. Laxenburg: International Institute for Applied Systems Analysis.

Pipponen, M. 1999 . *Transition in the Forest Sector of the Republic of Karelia*. IIASA Interim Report IR-99-070. Laxenburg, Austria: International Institute for Applied Systems Analysis, forthcoming, December.

Polyakov, M. and Sydor. T. 2006. Forestry in the Ukraine: the road ahead? Comment. In: *Forest Policy and Economics* 8(1):1–5

Polyakova, L., Kyryluk, S., Storozhuk, V. and Popkov, M. 2001. Strategiya lisokorystuvannya ta potentsiyni mozhlyvosti. In: *Lisovyy i myslyvskyy zhurnal*. 1. pp. 13–27. (in Ukrainian).

Shorohova, E. and Tetioukhin, S. 2004 Natural disturbances and the amount of large trees, deciduous trees and coarse woody debris in the forests of Novgorod Region, Russia. In: *Ecological Bulletins* 51: 137–147.

Shvidenko, A. and Andrusishin, V. 1998. *Ukraine: the conditions and prospects of the forest sector*. Unpublished manuscript, IIASA, Austria.

Solberg, B. and 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. Washington DC: The World Bank.

Synyakevych, Ih. 2004. *Ecologichna i lisova polityka*. Lviv: ZUKTS (in Ukrainian).

Synyakevych, Ih. 2005. *Lisova polityka*. Lviv: ZUKTS (in Ukrainian).

Teplyakov V., Kuzmichev E., Baumgartner D., and R.Everett. 1998. *A History of Russian Forestry and its Leaders*. Washington State University in cooperation with the Federal Forest Service of Russia and the Pacific Northwest Station of the U.S.D.A. Forest Service

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

Volkov, A. and Gromtsev, A. 2004. *Antropogenic transformation of taiga ecosystems in Europe: environmental, resource and economic implications: Proceedings of International Conference*. Petrozavodsk.

World Bank, 2004. *Key challenges of the Russian forest policy reforms*. World Bank Discussion Paper. Washington DC: The World Bank.

Zibtsev, S., Kaletnik, M. and 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*. On: www.fao.org.