Barriers and bridges for intensified wood production in Russia: Insights from the environmental history of a regional logging frontier

Vladimir Naumov *, Per Angelstam, Marine Elbakidze

Forest-Landscape-Society Research Network, School for Forest Management, Faculty of Forest Sciences, Swedish University of Agricultural Sciences, PO Box 43, 739 21 Skinnskatteberg, Sweden

ABSTRACT

Russia sees the need to increase wood production. The aim of this paper is to contribute to the understanding of barriers and bridges in social and ecological systems for intensification of wood production in NW Russia. This requires that past development trajectories are understood. Using a local logging frontier in Russia's Komi Republic as a case study, we employed an environmental history approach to: (1) recreate the wood harvesting history for the period 1719–2014, (2) identify the main actors that produced this history, and (3) analyse what ideologies influenced decision making. First, after a long history of selective harvesting before the Russian Revolution in 1917, forests were rapidly clear-felled during the Soviet period 1921–1991. Following general economic deceleration, and thus severely reduced harvesting activities during 1992–1997, the rate of logging has increased slightly again. To conclude, barriers in ecosystems to intensification include Soviet legacies of large-scale harvesting, which resulted in a very uneven age distribution, limited and poorly conducted silviculture, as well as insufficient transport infrastructure. Additionally, social system barriers are a conservative mind-set at the policy level, unpredictable conditions for forest use rights and ownership, and limited value-added production at local level. Developing predictable rules and norms, forest zoning at local to regional scales, and the emergence of place-based multi-level collaborative learning concepts like Model Forest provide opportunity for bridging the observed barriers.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

Boreal forests have the largest area among all forest biomes in the world (McLaren & Turkington, 2013), and provide essential renewable wood resources used for value-added production of considerable economic benefits for businesses, the state and employment in rural areas. Growing markets at regional, national and international levels demand more forest products, including both wood and bioenergy. Boreal forests also provide other ecosystem services necessary for biodiversity conservation and human well-being (Молчанов, 1961; Ваганов et al., 2005; Stryamets et al., 2015). In addition, the sustainability of boreal forests for mitigation and adaptation to climate change has also been highlighted (Carlson et al., 2009). Satisfying this complexity of benefits is a challenge for implementation of sustainable forest management in boreal forests, of which Russia hosts the majority (Anonymous, 2012b).

The development of forest management systems ranges from extensive to intensive (Duncker et al., 2012). This gradient is uniquely well represented from West to East in the European continent's boreal biome. After initial wood mining in boreal Fennoscandia during the 19th century, intensive forest management has restored forest

landscapes as wood production systems (Nordberg et al., 2013). Being more remotely located, the wood mining frontier swept across NW Russia much later (Björklund, 2000; Yaroshenko et al. 2001).

Beginning with Peter the Great in 1719 (Редько & Редько, 2002), Russia's forestry consists of three distinct periods of societal change, which affected forest management. First, Russia developed into a major early provider of wood, amounting to about one third of world forest exports in the beginning of 20th century (Генверт, 1926), and encouraged sustained yield forestry (Тюрмер, 1891). Second, after the Russian revolution in 1917, the socialistic ideology discarded economic factors (Knize & Romanyuk, 2006), which led to intense wood mining. Third, after the collapse of the Soviet Union 1991 market economy re-emerged which seeks to increase the yield of wood through intensification of forest management. There are thus two visions about forestry in Russia. The first is "wood mining", i.e. harvesting where the timber volume is highest and leaving clear-cuts for natural re-growth. The second sees forestry as "agriculture of timber", i.e. silviculture for maximum economical profit (Knize & Romanyuk, 2006).

There is a growing interest in Russia to increase the productivity of wood per unit area and time in already harvested areas (e.g., Nordberg et al., 2013). Russia's forest industry aims for intensified wood production as an integrated part of sustainable forest management (Anonymous, 2013; Nordberg et al., 2013). However, even if the ambition in Russia is to encourage intensive forest management

* Corresponding author.
E-mail addresses: vladimir.naumov@slu.se (V. Naumov), per.angelstam@slu.se (P. Angelstam), marine.elbakidze@slu.se (M. Elbakidze).

(Elbakidze et al., 2013) current Russian forestry practices can still be characterized as wood mining (Nordberg et al., 2013). The Scandinavian model of intensive forest management is perceived by industrial forestry stakeholders in Russia as the best model for economically profitable forestry (Knize & Romanyuk, 2006). Consequently, there are attempts to introduce this forest management model in Russia. At the same time, Russia still hosts remotely located large intact forest landscapes (Yaroshenko et al. 2001; Potapov et al., 2008), and there is opportunity to conserve biodiversity at near-natural levels in such areas. Intensified wood production is thought to solve several problems: (1) sustained supply of sufficient raw material for forest industry (Holopainen et al., 2006), (2) protect pristine boreal forests from human intervention (Fredericksen & Putz, 2003), and (3) mitigate societal issues like unemployment in logging villages and thus increased urbanization (Becker et al., 2012).

Intensification of wood production has many definitions. The intensity of forestry may be described using both economic and ecological dimensions, which are generally inversely related (e.g., Bergseng et al., 2012; Mönkkönen et al., 2014). Economically, intensification is seen as a consolidation of all production factors such as soils, machinery, energy and manpower with the aim to get the highest financial net return from forest ecosystems (Sundberg & Silversides, 1988). Intensive forest management includes silvicultural operations aimed at increasing sustained yield wood production per area unit, e.g., scarification, planting or seeding, pre-commercial cleaning, fertilization and commercial thinning. The level of management intensity defines forest management approach (Duncker et al., 2012), and can be sustained at multiple levels. Ecologically, intensification describes a higher degree of anthropogenic transformation of near-natural systems caused by forest management operations (Peterken, 1996; McRoberts et al., 2012).

Countries with transition economies (Myant & Drahokoupil, 2011), such as Russia, share several challenges regarding the reformation of their natural resource use, governance and management (Holopainen et al., 2006; Nystén-Haarala, 2012). This requires that past trajectories in landscapes and regions are understood. Human impact creates path dependence effects on both biophysical landscapes and societal legacies (Wilson, 2012). A wide range of scholars has therefore stressed the need to consider both social and ecological systems when studying implementation of policies about sustainable development and sustainability (Berkes and Folke, 1998; Liu et al., 2007; Redman et al., 2004). As a tool for extracting historical lessons to help addressing today's challenges in forest landscape management and governance, Marsh (1864) very early stressed the need to study the transformation of the interaction of humans and the natural environment (Lowenthal, 2000). As an interdisciplinary field of research, environmental history is an appropriate framework for studying the dynamics of landscapes as social-ecological systems. The interest in understanding the history of landscapes as social-ecological systems has appeared in many contexts including studies in North America (Worster, 1994), South Africa (Beinart, 1984) and in former European tropical colonies (Grove, 1989). Similarly, implementing sustainable forest management policy requires understanding the history of forest landscapes, including both their biophysical, anthropogenic and perceived dimensions (Angelstam et al., 2013b). While there are numerous works on forest landscape history in different countries (Bürgi, 1999; Ericsson et al., 2005; Hessburg & Agee, 2003; Steen-Adams et al., 2015; Östlund et al., 1997), practically no information exists on the historical dynamic of interconnections between ecological and social systems regarding Russian forestry.

The aim of this paper is to better understand barriers and bridges (see terminology in Gunderson et al., 1995) for intensification of wood production in NW Russia by analysing past trajectories in a concrete representative region. Using regional and local logging frontier gradients from a large river to its headwaters in the Komi Republic as a case study we employ an environmental history approach for the period 1719–2014. First, we reviewed the forest use history, and re-created this

in detail using spatial data for the period 1965–2014 when the timber frontier passed this region. Second, with a focus on the actors we reviewed the general forest use history during the entire period. Third, we analysed ideology behind the forest landscape history on international, state, regional and local levels for the same period. Finally, based on the insights derived from the environmental history analysis, we discussed barriers and potential bridges for intensification of wood production in both social and ecological systems in NW Russia.

2. Methodology

2.1. Framework

To understand barriers and bridges for forestry intensification landscapes' ecological and social systems need to be analysed. We used Worster's (2005) environmental history framework to study a geographical area as space and place: (1) natural environments of the past, (2) human modes of production, and (3) perception, ideology and value. This approach reflects the landscape concept's biophysical, anthropogenic and perceived dimensions (Angelstam et al., 2013a,c).

The environmental history is strongly influenced by the contemporary political regime. Therefore the analysis was divided into three epochs of development in what is NW Russia today (Мунчаев & Устинов, 1998). These are the Russian Empire from the appearance of the first administrative body for forest management in Russia (1719–1917), the Soviet Union (1921–1991) and post-Soviet Russia (1991–2014). Each epoch demonstrates different world-views having specific traits (see Table 1).

In the discussion we defined barriers to intensification as weaknesses and threats leading to ineffective forest management, and bridges in terms of current strengths and future opportunities to successfully intensify wood production. These barriers and bridges were defined based on the environmental history connecting ideology, actors and changes on the ground in biophysical landscapes. One can thus see barriers and bridges (Gunderson et al., 1995) as a SWOT-analysis (Hill and Westbrook, 1997), but without division into present and future factors. Barriers and bridges were then sorted into those relevant for social and ecological systems, respectively.

2.2. Study area

The NW part of the Russian Federation has the longest history of timber frontier development in Russia's boreal biome. Already in the late 17th century most of NW Russia's large trees near large rivers were selectively logged for ship-building. Timber was exported to Great Britain through the seaport of Arkhangelsk, and since 1704 also through St. Petersburg (Редько & Редько, 2002). Since shipyards were located in the estuaries of Northern Dvina river in NW Russia, the expansion of logging took place gradually as a moving frontier in the upstream direction. A good example of this is Northern Dvina's largest tributary, the Vychegda river in the Komi Republic. Here industrial logging for local use commenced in the 18th century (Галасьев, 1961), and logging of large old trees and old-growth forests were intensified during Soviet period (Редько & Редько, 2002).

As a typical example of this moving logging frontier, we chose the Kortkeros rayon (an administrative unit of the second level in Russia) as a case study located in the catchment of the Vychegda river in the Komi Republic (Fig. 1). The Vychegda river divides Kortkeros rayon into a northern and a southern part. The two tributaries of Vychegda in Kortkeros, Nivshera in the north and Lokchim in the south, both represent gradients in forest use created by a moving frontier of logging. Boreal forests in the Kortkeros rayon as in the Komi Republic are characterized by the tree species *Picea abies* (L.), *Pinus sylvestris* (L.), *Populus tremula* (L.), and *Betula* spp. Altitude ranges from 69 to 325 m a.s.l.

The Kortkeros rayon was established in 1939. The total area comprises about 1,970,000 ha (Турьева, 1989) which constitutes 4.7% of