



Natural disturbances in forest ecosystems of Northern Eurasia: ecological, social, and economic consequences

Anatoly Shvidenko (1,2), Dmitry Shepaschenko (1,3), Andrey Krasovskii (1), Andrey Filipchuk (4), and Florian Kraxner (1)

(1) ESM, IIASA, Laxenburg, Austria (shvidenk@iiasa.ac.at), (2) Institute of Forest Siberian Branch of RAS, Academgorodok, Russia, (3) Forestry Faculty, Bauman Moscow State Technical University, Mytishi, Russia, (4) All-Russian Research Institute of Silviculture and Mechanization of Forestry, Pushkino, Russia

Enormous area of forests of Northern Eurasia (basically limited by territories of Russia, above 20% of the world forests) makes them a phenomenon of a global meaning. They are mostly dominated by coniferous species (>70% of the total area), with a substantial share of mature and overmature stands (~60%) and large remote, practically unmanaged and unprotected areas. The average warming over the country exceeded the global rate at 2.5 times during the last 50 years, and the climate variability has been growing dramatically. All together defines tense regimes of natural disturbances (D) in the country's forest ecosystems. Based on integration of available information sources, major types of natural D enveloped on average around 12 mln ha yr⁻¹ of forest land during the beginning of 21st century (2000-2015). Major impacts were provided by wildfire (the affected area comprised ~4.6 mln ha yr⁻¹ in stocked forests and 1.5 mln ha yr⁻¹ on unstocked forest land of the total area of vegetation fires about 10 mln ha yr⁻¹); annual losses of forest due to fire are estimated to be 2.2 mln ha yr⁻¹. The area affected by biotic agents is estimated at 4.8 mln ha yr⁻¹. There is a positive trend of increasing damaged area but its statistical significance is low due to large interannual variability. The presentation analyzes quantitative characteristics of the disturbance regimes in terms of extent, frequency, and severity; changes of productivity, resilience and successional dynamics of forest ecosystems; impacts on major biogeochemical cycles (carbon, nitrogen); short- and long-term consequences for environment, health and life conditions of population. We illustrate a particular ecological, social and economic threat of catastrophic (mega) fires as a consequence of heat waves like the heat wave in European Russia in 2010 which was accompanied by tens of thousands of premature deaths and economic losses at the level around USD 10 billion. Using the fire model FLAM, we consider projections of fire risk during the 21st century within 4 IPCC Scenarios (RCP2.6 – RCP8.5) and urgent needs of development and implementation of a special strategy and plan of actions on transition to adaptive risk resilient forest management in Russia.