

Victor M. Lukashevich, Ludmila V. Schegoleva, Pavel O. Schukin

GIS-technology in forest harvesting planning

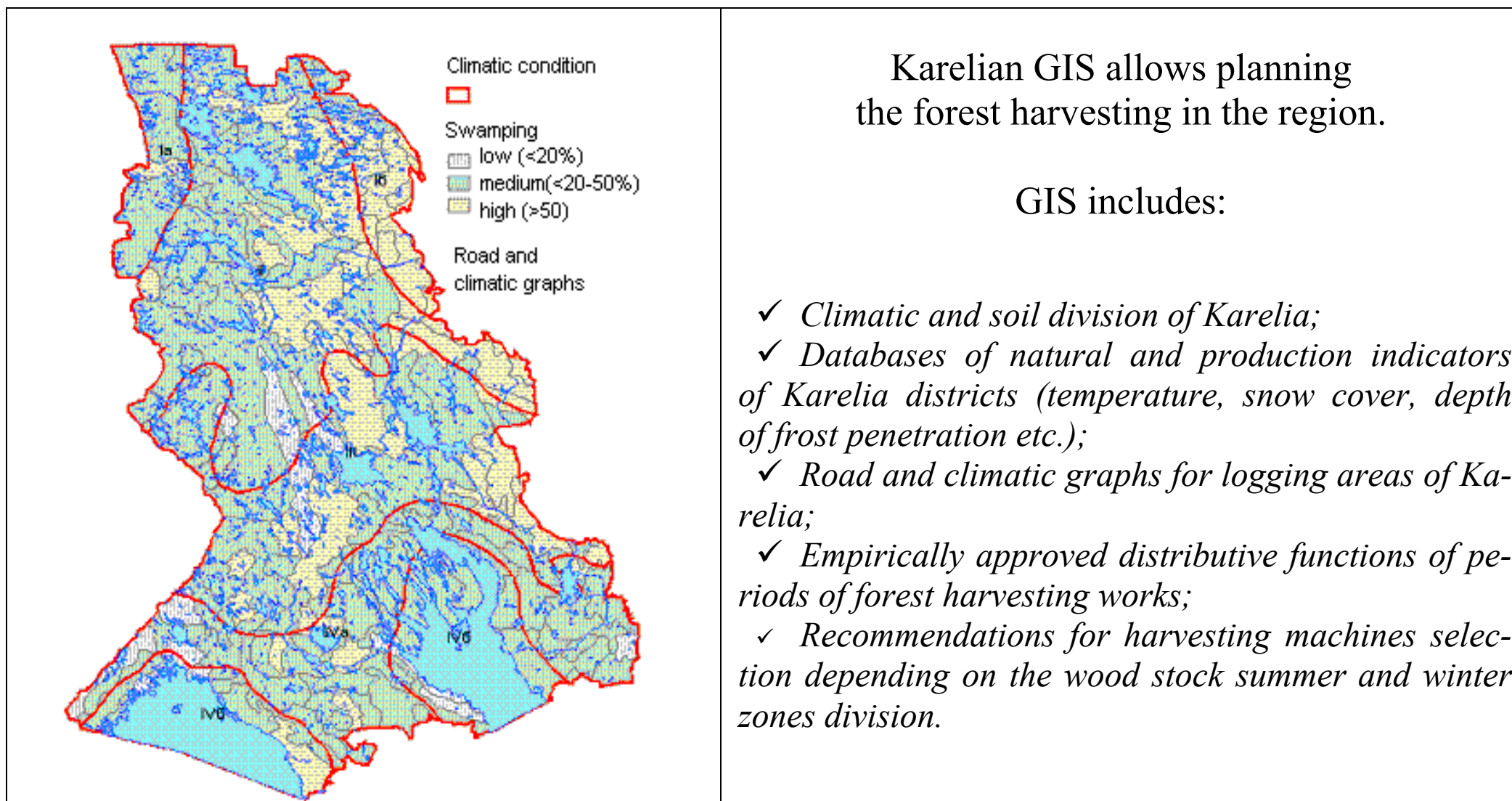
*The project was made for the Ministry of Industry and Natural Resources of the Republic of Karelia,
with participation of Karelian Scientific Research Institute of Timber Industrial Complex (KarSRITIC),
The Department of Applied Mathematics and Cybernetics of the Petrozavodsk State University,
The Department of Technology and Equipment of Forest Complex of the Petrozavodsk State University.*

The Goal



To show
the necessity and opportunities
of geo-information systems
in forest harvesting planning

The GIS of the Republic of Karelia



Karelian GIS allows planning the forest harvesting in the region.

GIS includes:

- ✓ *Climatic and soil division of Karelia;*
- ✓ *Databases of natural and production indicators of Karelia districts (temperature, snow cover, depth of frost penetration etc.);*
- ✓ *Road and climatic graphs for logging areas of Karelia;*
- ✓ *Empirically approved distributive functions of periods of forest harvesting works;*
- ✓ *Recommendations for harvesting machines selection depending on the wood stock summer and winter zones division.*

Seasonal distinction of forest harvesting



Karelian swamps prevent the steady forest harvesting.

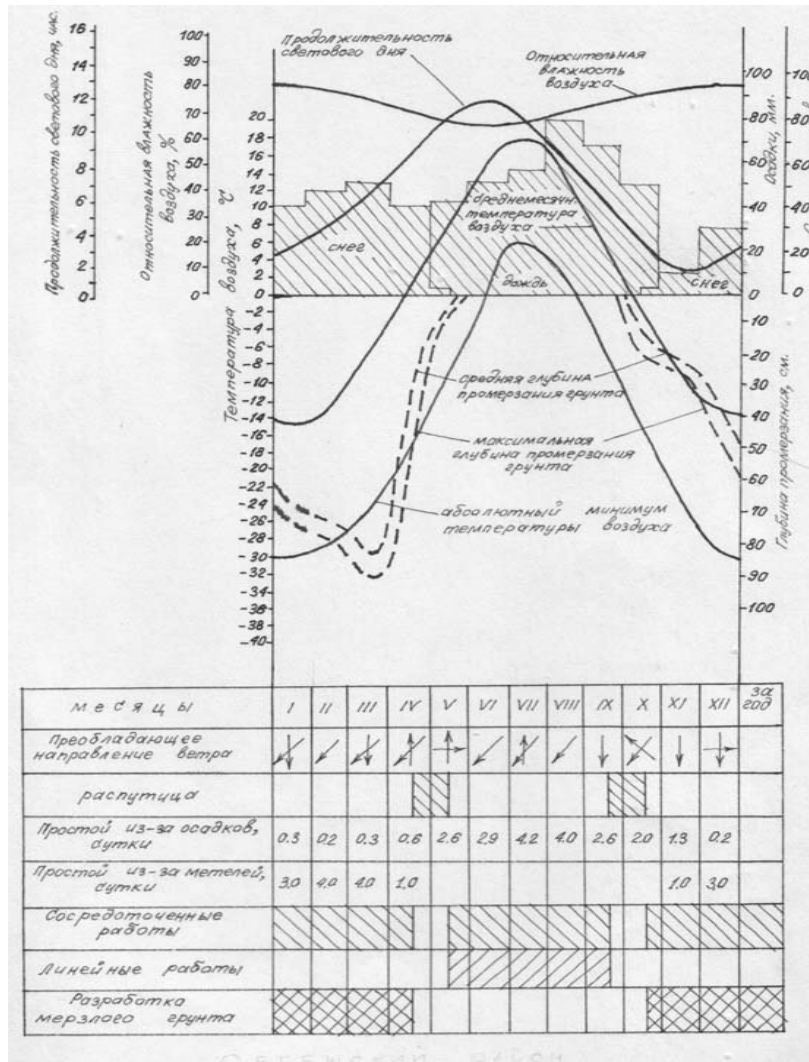
In spring and autumn haul roads become insuperable for timber carrying transport. The logs left in piling places get rotten and lose their marketability.

Thus, the wood stock surrounded by swamps should be harvested and removed in winter, using snow and snow-iced roads.

Picture 1: Winter road across the swamp

Picture 2: The road for wood removal is hardly penetrable in autumn

Road and climatic graphs



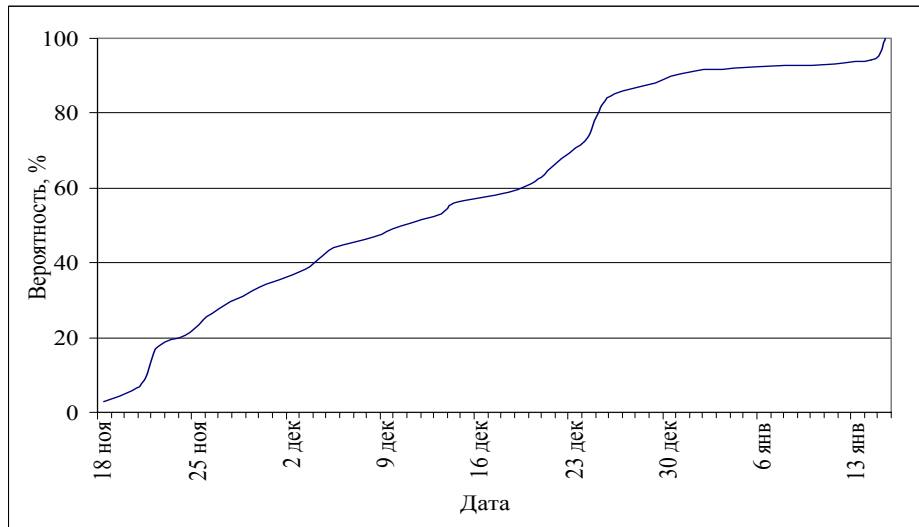
Karelia stretches out from the north to the south, which cause the diversity of nature and production conditions within the region.

Road and climatic graphs for each regions of Karelia allows planning road construction and forest harvesting.

Electronic database of nature and production indicators are made for different parts of Karelia (temperature, snow cover, depth of frost penetration etc.).

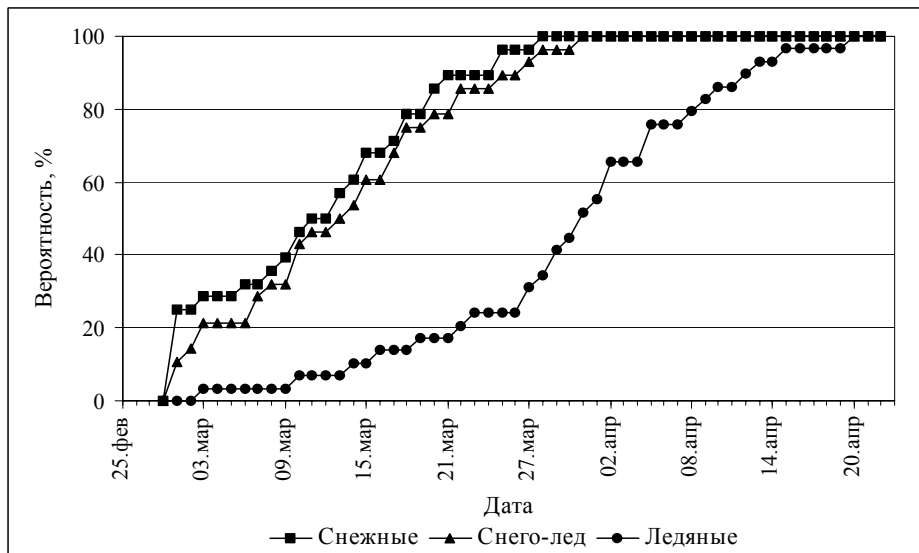
Picture: Road and climatic graphs for Segezhskiy district of Karelia

Forest harvesting planning



Nature and production conditions analysis was carried out for all districts of Karelia to define the distributive functions for beginning and finishing of wintertime wood removing.

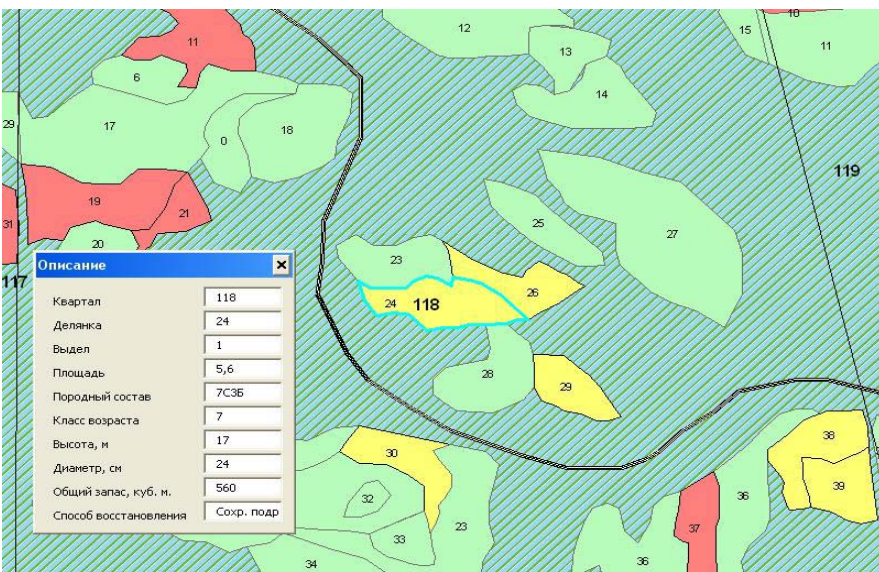
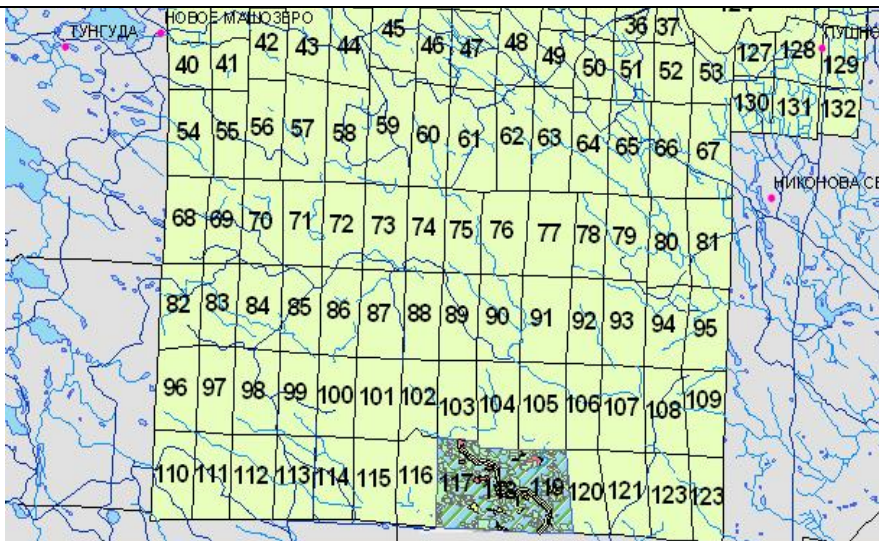
According to this data, the wood removal in Segezhskyi district would start by the 23 of December with the 80 percent probability.



Picture 1: The beginning of forest cutting in winter season

Picture 2: The end of forest cutting in winter season

Function and information, provided by the GIS of Karelia



Increasing the scale of Karelian GIS we may get the forest harvesting quarters for each municipal district with the following information for each quarter:

- ✓ *Databases of natural and production indicators of Karelia districts (temperature, snow cover, depth of frost penetration etc.);*
- ✓ *Borders for forest cutting areas and swamps bounds;*
- ✓ *Technological indicators for wood cutting areas (square, forest stock, medium height of trees, diameter of trees etc.);*
- ✓ *Road and climatic graphs of districts and distributive functions for harvesting machines work conditions.*

Due to the GIS, a forest technologist may plan the rational distribution of wood stock and organize forest harvesting.

Conclusions



GIS-technologies allow:

- ✓ *To organize optimal forest harvesting;*
- ✓ *To reduce economic losses in timber harvesting industry;*
- ✓ *To choose the most effective machine sets and their work conditions;*
- ✓ *To define the plan of the road construction;*
- ✓ *To fulfill the nature protection legislation.*

