GIS forestry project of seasonal roads in the Siberian federal district, Russia

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INTRODUCTION & AIM

The seasonal use of roads includes construction and maintenance activities, depending on the season and weather conditions within a certain area. There are a number of scientific papers and web-GIS projects in Russia and worldwide [1] discussing the seasonality of road use with variants of season duration, roads naming, technical methods of construction, etc. The regional forestry industry uses seasonal roads mainly for firefighting and logging, as additional elements to public road infrastructure [2].
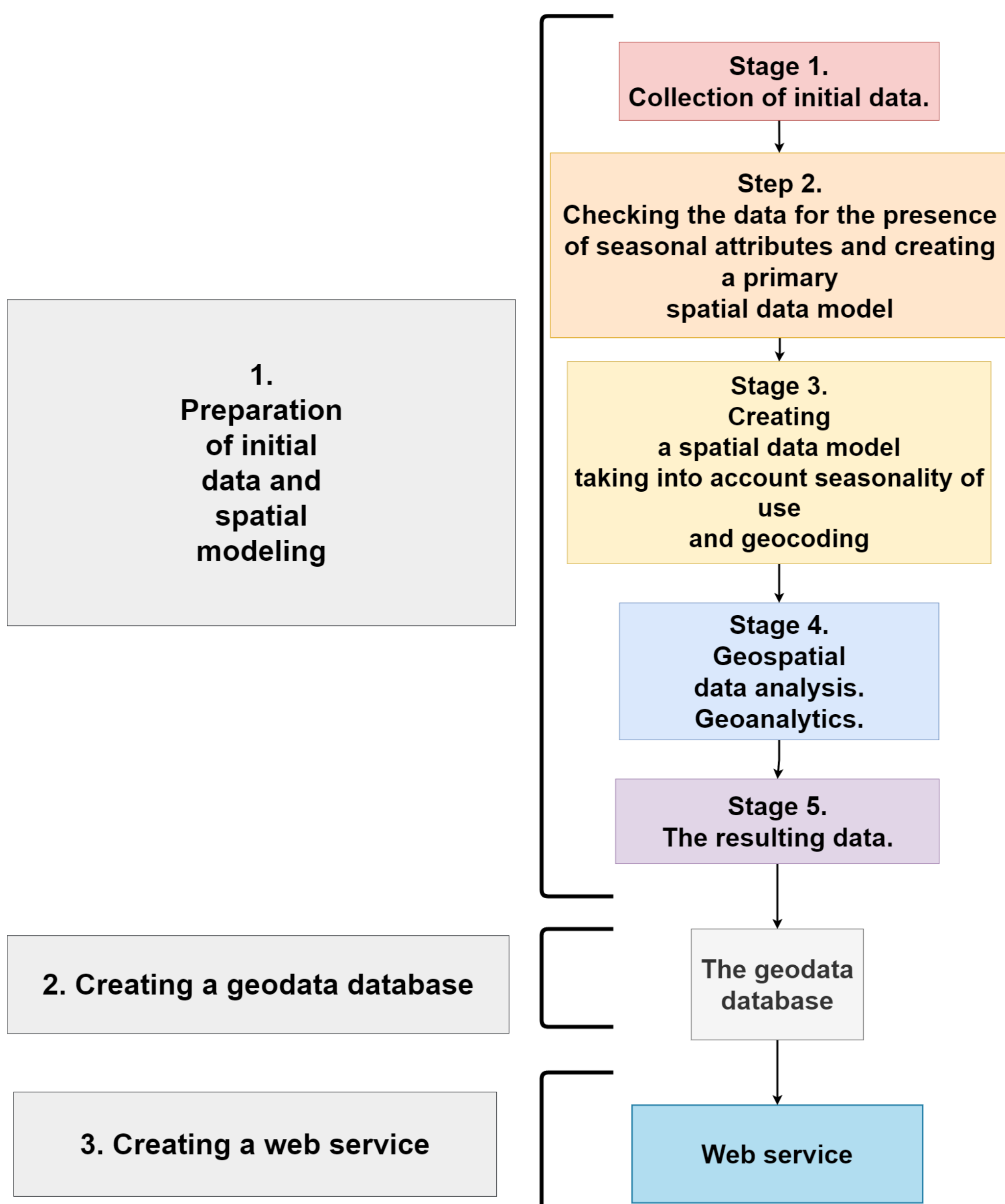
The present research had the aim to develop a forestry GIS project with spatial modelling of seasonal road use in the Siberian federal district of the Russian Federation. The chosen district has a large area, a constant need for the development of road infrastructure, and various regional forestry challenges.

In order to reach our goal, we conducted a review of works on the spatial modelling of roads and their seasonality factor; created a model of permanent and seasonal roads use; and developed a database with the attributes of permanent and seasonal roads, finally presented as a web geoservice.
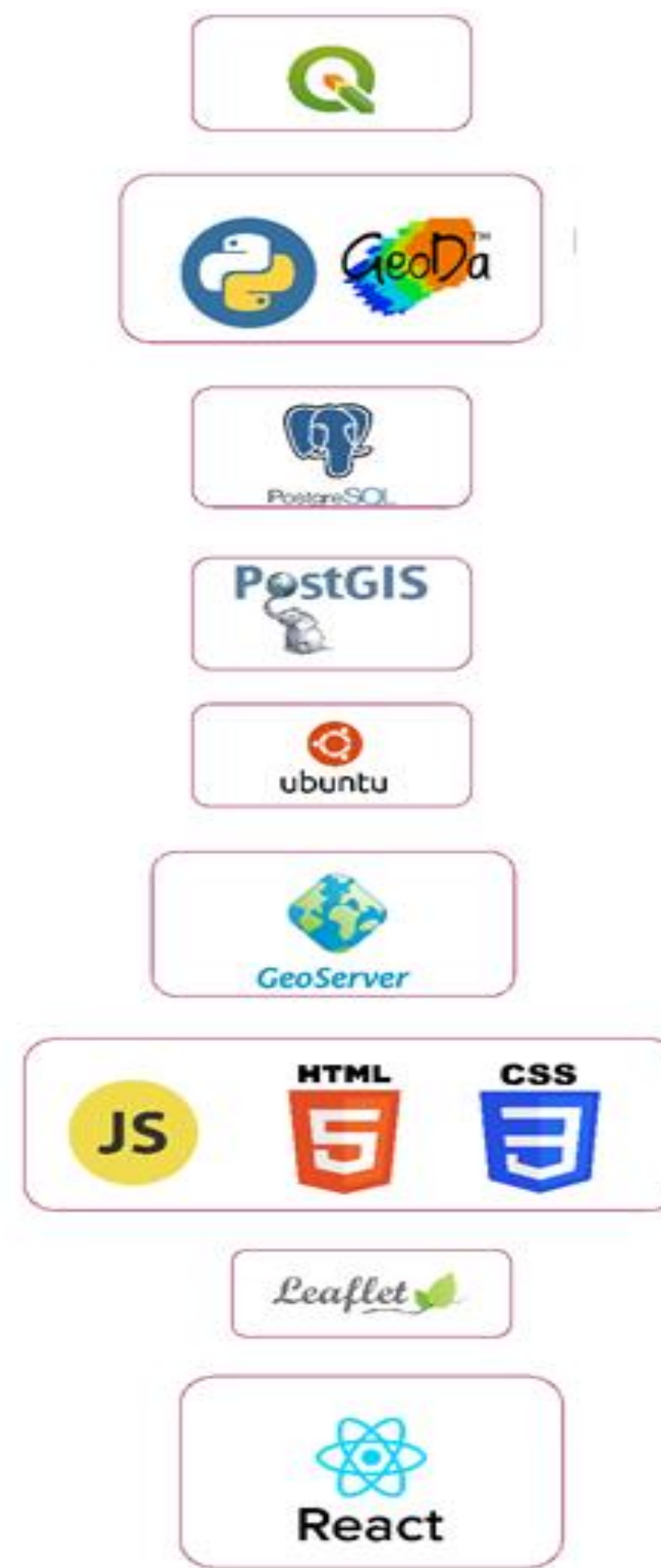

Roads of seasonal use

winter road ("zimnik")

summer road ("letnik")

Winter road Yeniseisk – Yartsevo -Vorogovo – Bor (2023)

Summer road as connection Buryatia Republic to town Bratsk, Irkutsk region (2022)

METHOD

Research methodology

Stage 1.
Collection of initial data.

Step 2.
Checking the data for the presence of seasonal attributes and creating a primary spatial data model

Stage 3.
Creating a spatial data model taking into account seasonality of use and geocoding

Stage 4.
Geospatial data analysis. Geoanalytics.

Stage 5.
The resulting data.

1. Preparation of initial data and spatial modeling

2. Creating a geodata database

3. Creating a web service

The geodata database

Web service

RESULTS & DISCUSSION

- GIS implementation is based on the open source software and includes modelling of road network in QGIS application, using GeoDa and algorithms in Python;
- PostgreSQL/Post GIS was chosen as the software to create the geodatabase;
- GIS server implemented with Linux and GeoServer;
- JavaScript (JS), HTML and CSS were used in combination for the frontend part;
- Leaflet and React libraries ensured the stability on the client side.

Desktop QGIS-project
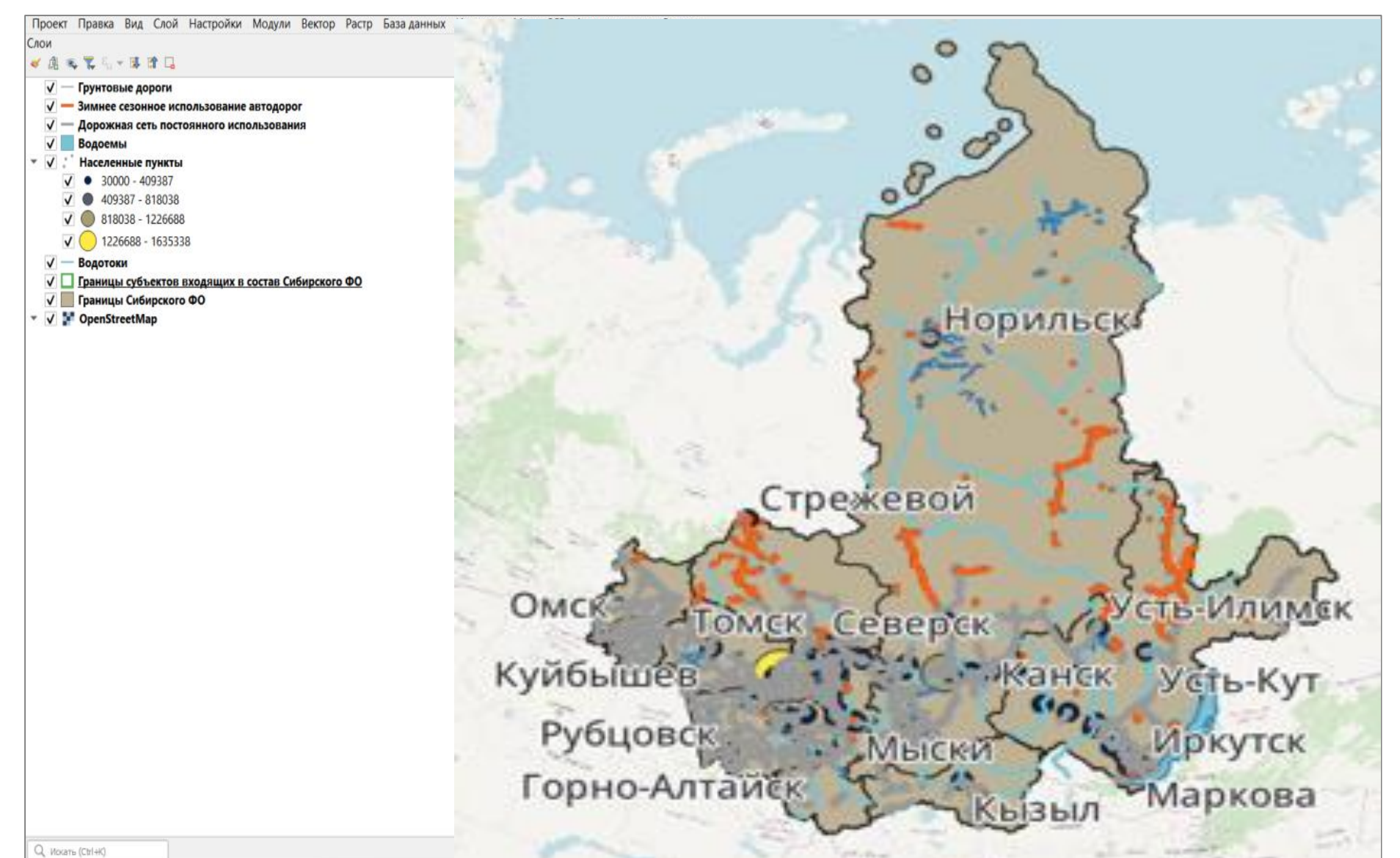
CONCLUSION

There is a lack of open data on the seasonal use of roads for the Siberian federal district and generally for Russia. According to the data we managed to collect, the Tomsk region, as part of the Siberian federal district, has the highest density of seasonal roads, and this could be explained by its actively developing natural resources.

The authors declare no conflicts of interest.

FUTURE WORK / REFERENCES

The regional services of the Emergency Situations Ministry and Rosavtodor, as well as regional administrations, are the most interested in such kinds of research in Russia.

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