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Retrospective analysis of OSM road data of Siberian federal district, Russia for the forest transport modeling

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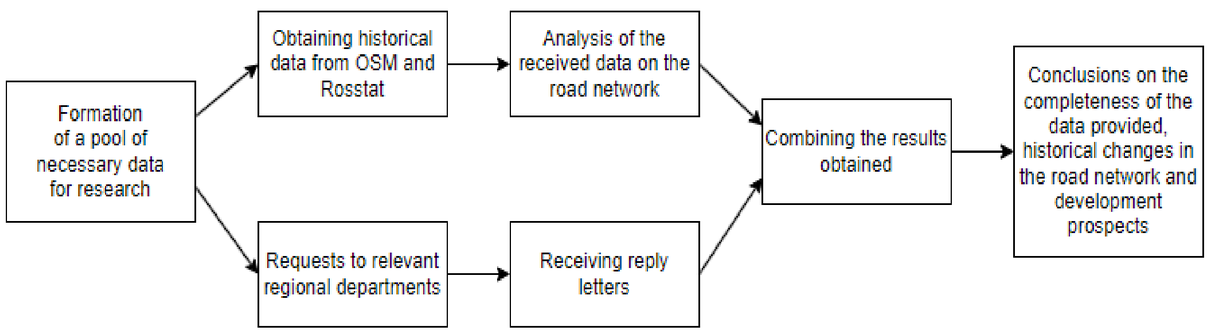
INTRODUCTION & AIM

The road network is a key element for the forestry in any region, and it has a significant impact on the overall development of the territory [1]. The study aims to evaluate the applicability of road data for infrastructural GIS projects and forest transport modeling. Study topic is relevant due to the implementation of the Russian National project "Safe and High-Quality Roads“ and transport strategies of a number of regions within the Siberian federal district till 2030.

We analyzed the parameters of archived road data on the Siberian federal district, Russia, for 2009, 2016, 2019, and 2023. The following tasks were set in accordance with the goal: to identify the dynamics of data changes from 2009 to 2023 for the regions and forestry management units of key areas, and to evaluate the geometry and attributive completeness of OSM (OpenStreetMap) road data [2].

METHOD

Research methodology



Attributes of roads in the OSM-datasets (examples)

May 2009

Автодороги — объектов всего: 10624, отфильтровано: 10624, выбрано: 0

	NAME	REF	HIGHWAY	ONEWAY	BRIDGE	TUNNEL	MAXSPEED	LANES	WIDTH	SURFACE	OSM_TYPE	OSM_ID	NAME_EN	NAME_RU
1	тракт Змеиног...	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	9103424	NULL	NULL
2	NULL	NULL	trunk	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	13892853	NULL	NULL
3	Северный обх...	NULL	trunk	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	13892890	NULL	NULL
4	NULL	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14031552	NULL	NULL
5	NULL	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14031765	NULL	NULL
6	NULL	NULL	primary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14031836	NULL	NULL
7	NULL	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14033641	NULL	NULL
8	NULL	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14034484	NULL	NULL

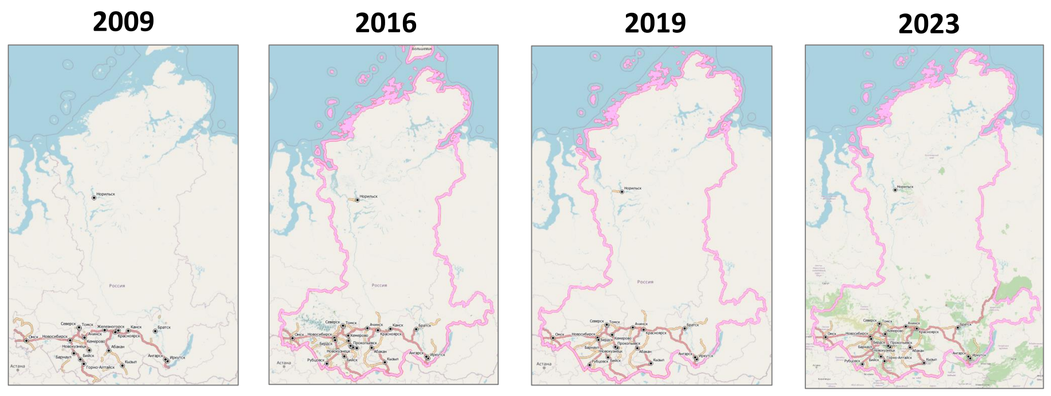
December 2023

Автодороги — объектов всего: 867856, отфильтровано: 867856, выбрано: 0

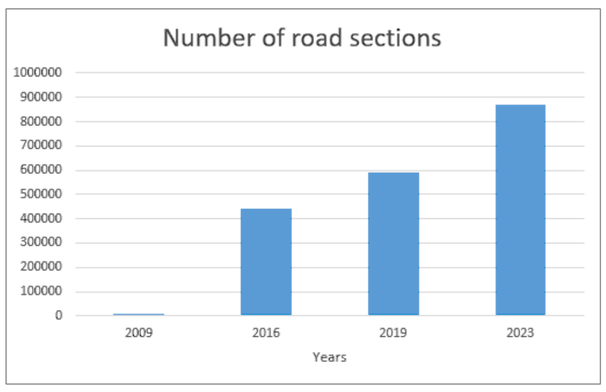
	NAME	REF	HIGHWAY	ONEWAY	BRIDGE	TUNNEL	MAXSPEED	LANES	WIDTH	SURFACE	OSM_TYPE	OSM_ID	NAME_EN	NAME_RU
1	NULL	A-322	trunk	NULL	NULL	NULL	RU:rural	NULL	NULL	asphalt	way	9103424	NULL	NULL
2	«Иртыш»	P-254	trunk	yes	NULL	NULL	RU:rural	1	NULL	asphalt	way	13892853	Irtysh Highway	«Иртыш»
3	«Иртыш»	P-254	trunk	NULL	NULL	NULL	RU:rural	2	NULL	asphalt	way	13892890	Irtysh Highway	«Иртыш»
4	NULL	NULL	secondary_link	yes	NULL	NULL	NULL	NULL	NULL	asphalt	way	14031836	NULL	NULL
5	улица Ленина	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14034484	NULL	NULL
6	NULL	50К-01	secondary	NULL	NULL	NULL	NULL	NULL	NULL	gravel	way	14034994	NULL	NULL
7	«Иртыш»	P-254	trunk	no	NULL	NULL	RU:rural	2	NULL	asphalt	way	14035097	Irtysh Highway	«Иртыш»
8	NULL	NULL	secondary	NULL	NULL	NULL	60	1	NULL	NULL	way	14165603	NULL	NULL
9	улица Луначар...	NULL	secondary	NULL	NULL	NULL	NULL	NULL	NULL	NULL	way	14165945	Street Lunachar...	улица Луначар...
10	«Иртыш»	P-254	trunk	NULL	NULL	NULL	RU:rural	2	NULL	asphalt	way	14167610	Irtysh Highway	«Иртыш»

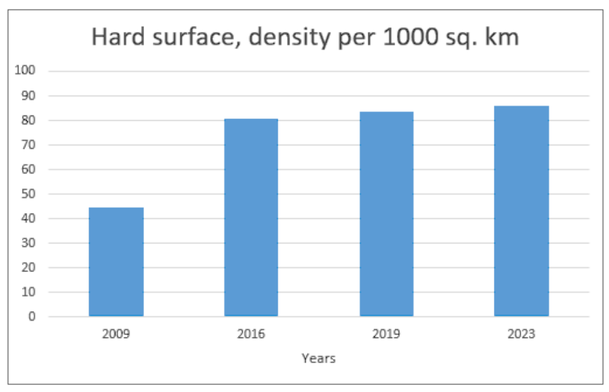
RESULTS & DISCUSSION

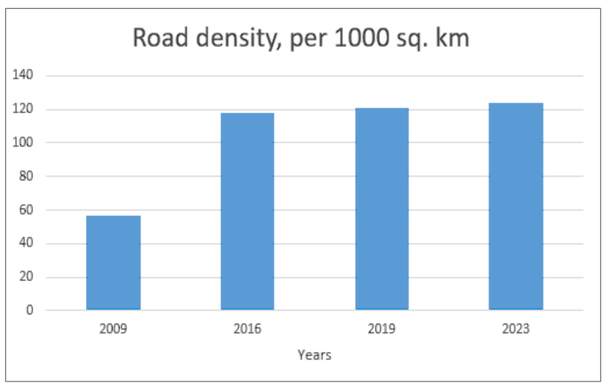
Visualization of OSM road datasets for the Siberian federal district (year)



The number of road sections: 2009 => 2023 increased more than 80 times.
Paved roads (hard surface – asphalt and concrete roads):
2009 => 2023 almost 2 times more.
The number of federal and regional roads: 2009 => 2023 - 4 times more.
Road density: 2009 => 2023 - 2.2 times more.







- The most developed region in the dynamics of changes in the road network data was the Republic of Khakassia, where the number of roads increased more than threefold from 2016 to 2023;
- The least developed was the Altai Region, with an almost unchanged number of roads. There was a rather low density of road network in the Krasnoyarsk, Irkutsk, and Tomsk regions;
- Forestry division for the Siberian federal district includes 286 units, and percentage of roadless units decreased from 27% in 2009 to 2% in 2023.

CONCLUSION

- low road network density remains in Krasnoyarsk, Irkutsk and Tomsk regions;
- number of paved roads could be increased in the Republic of Tuva and Krasnoyarsk region;
- forestry units of highest road density are located within Novosibirsk, Omsk, and Kemerovo (Kuzbass) regions.

The authors declare no conflicts of interest.

FUTURE WORK / REFERENCES

We state that present OSM road datasets as of 2023 are of help for projects that deal with infrastructure, and especially for forest transport modelling. The content of OSM datasets has to be compared to road data from the regional organizations and companies.

1. Podolskaia E., Ershov D., Kovganko K., 2020. Automated construction of ground access routes for the management of regional forest fires. *J. For. Sci.* 66:329–338. https://doi.org/10.17221/59/2020-JFS
2. Antunes F., Fonte C., Brovelli M. A., Minghini M., Molinari M., Mooney P. Assessing OSM road positional quality with authoritative data. Conference Proceedings. VII CNCG Conferencia Nacional de Cartografia e Geodesia. 2015. pp. 1-9.

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