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# How to assess and maximize the carbon sequestration potential of Russian forests?

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# Problem background

- Forests play the most important role in depositing carbon as they absorb carbon to support their phytomass growth, thus acting as a major regulator of the Earth's carbon balance.
- One of the most important elements of the global carbon budget is the boreal forest ecosystems, which have accumulated about one-third of the world's carbon stock: 997 ± 84 Pg of $CO_2$-equivalent (Pan et al., 2011).
- The particular importance of boreal forests is ensured by the fact that, unlike tropical forests, they do not experience the effect of intensive reductions as a result of predation (Bager et al., 2021).

# Russian forests: overview

- 815 mln ha = 20% of the global forest area.
- 38% of the total carbon stock of the world's boreal forest ecosystems.
- According to current official estimates, Russian forests (LULUCF sector) compensate for 26.6% of national greenhouse gas emissions.
- Huge reserves of forests is the most important natural advantage of Russia in the struggle for the future competitiveness of the national economy through the implementation of measures to increase carbon sequestration by forest ecosystems

# Forest carbon budget estimates: a long debate

# Estimates of the Russian forest carbon budget

| Source | Official application | Features of the methodology | Carbon sink estimate, million tons of $CO_2$-eq per year |
|---|---|---|---|
| **ROBUL** (Zamolodchikov, 2011) | IPCC-approved National inventory of anthropogenic emissions and removals of greenhouse gases by IGCE Roshydromet and RAS | Conversion coefficient method (based on IPCC guidelines) applied to the data of State Forest Registry (SFR) | 536 |
| VNIILM (Filipchuk et al., 2018) | FAO Forest Resource Assessment project | Alternative interpretation of some points of IPCC guidelines. Data: SFR | 1906.3 |
| IIASA (Shvidenko, Schepaschenko, 2014) | NA | Satellite-based calculations used to update the SFR data | 2002 ± 440 |
| Dolman et al., 2012 | NA | Multi-method synthesis: DGVMs, eddy-covariance, inverse models, land ecosystem assessment | 2537 |

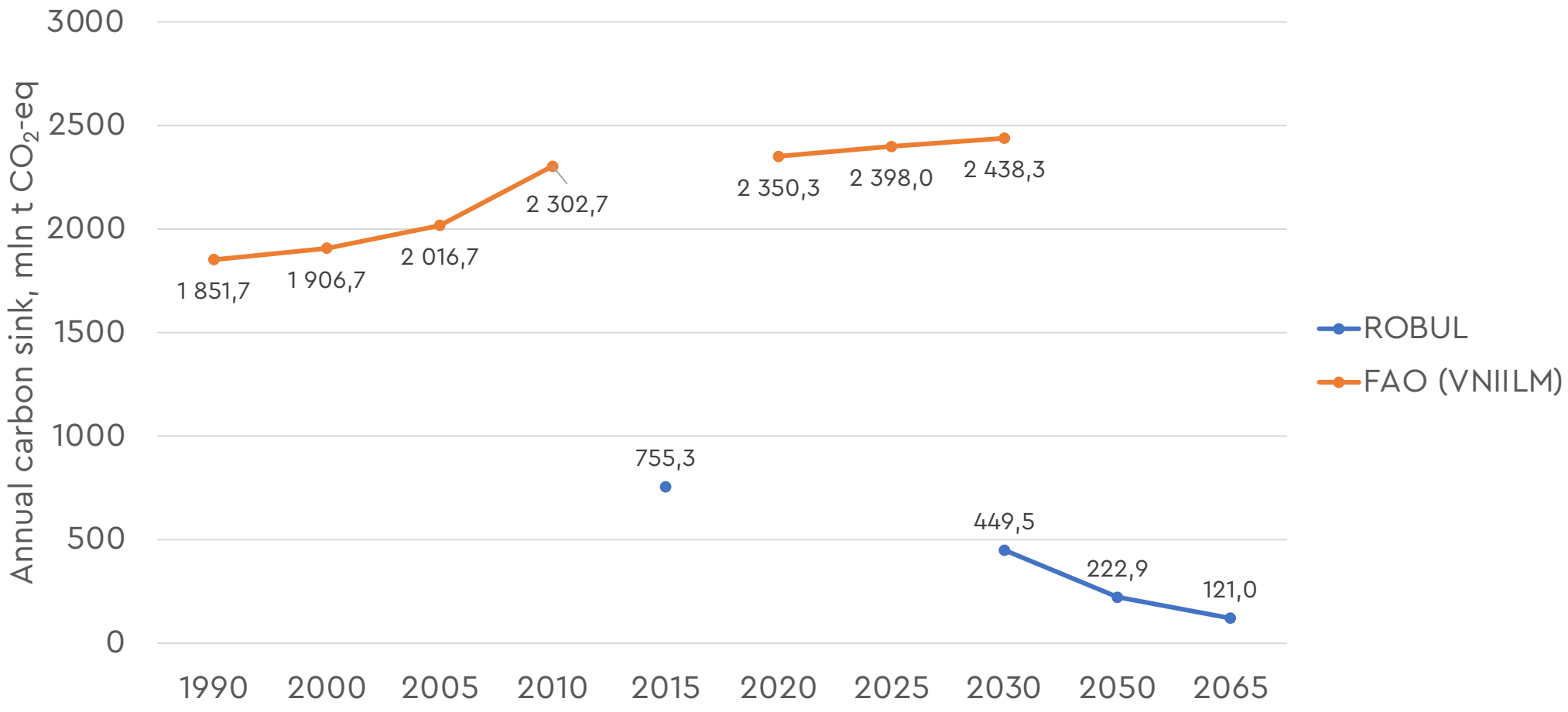
Note. Sink estimates are given for different periods, as it was stated in the corresponding publications.

# How to improve the current official forest carbon budget estimates

- Low quality and relevance of State Forest Registry data (average renewal rate is 25 years) is a commonly recognized shortcoming.
- Results of State forest inventory might be used to justify the SFR, but 3—4 years are needed to process the data. Results could rise by 30%.
- The estimates are solely based on terrestrial techniques and official state forest data (as it is prescribed by the IPCC guidelines) ignoring the satellite imagery products.

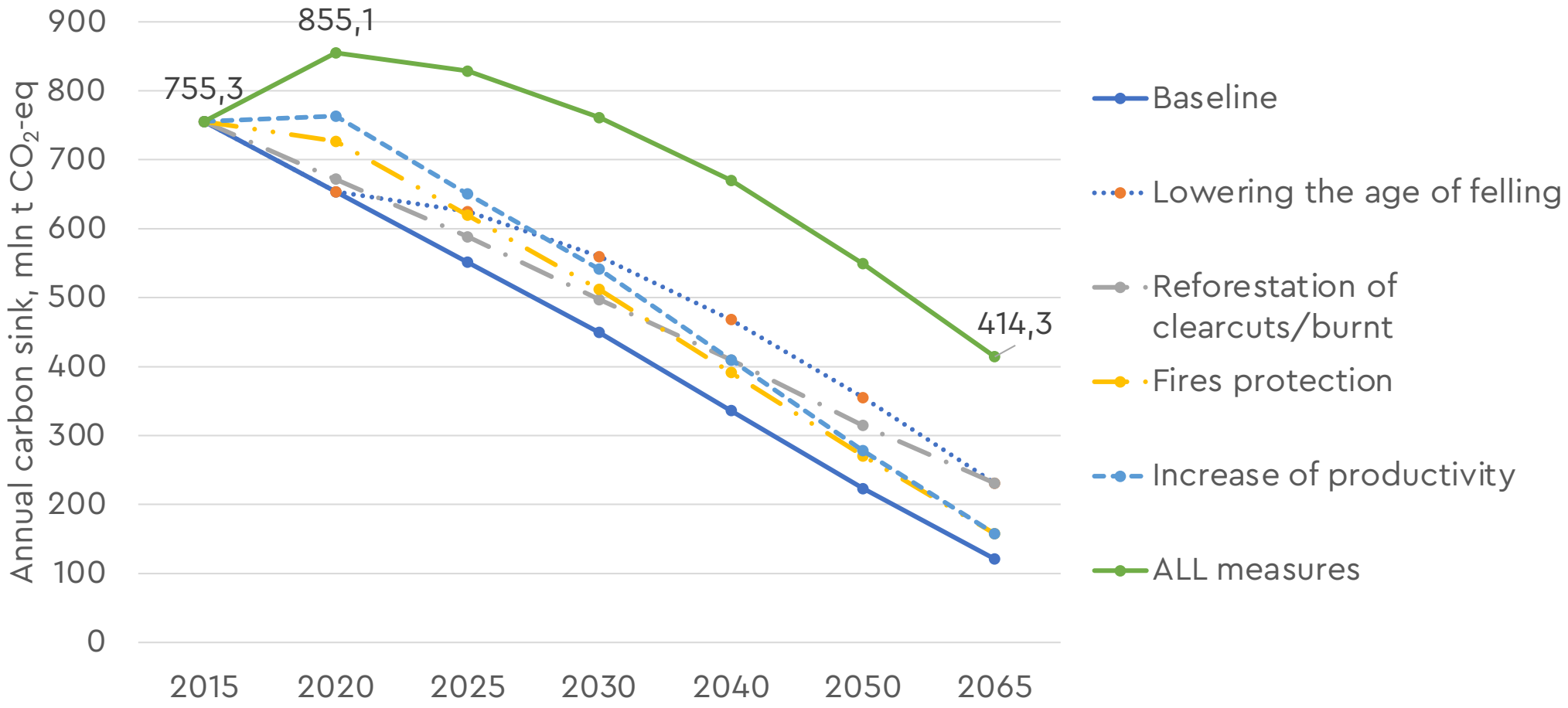
Note. We focus only on points that were not rejected by the authors and official users of ROBUL.

# Russian forest carbon budget outlook: ROBUL vs. FAO (VNIIILM)




Sources: FAO, 2012; Zamolodchikov, Grabovskii, Chestnykh, 2019. BAU scenarios

# Contribution of mitigation strategies according to ROBUL




Source: compiled by the author based on data from Zamolodchikov, Grabovskii, Chestnykh, 2019

# Economic potential of ROBUL-based mitigation strategy (calculation exercise)

- Cost of $CO_2$ ton sequestration = $41.2 in 2020.
- Annual gain of mitigation projects is $8.3 bln in 2020 growing up to $33.3 bln in 2065.
- $10.2 per ha of forest area per year could be spent on the proposed mitigation projects (not accounted for discount rate) growing up to $40.8 in 2065.
- All $ are 2015 USD.
- Results are comparable to the literature (e.g., Eriksson et al., 2018).

# Maximizing the carbon sequestration potential of the Russian forests

# Improving the control for forest disturbances

- The rate of forest fires is growing up due to climate change.
- One of the major source of forest fires are insect pests' outbreaks including the species of pests moving to new areas.
- Most part of fires are occurring in the remote places and could not be extinguished with a reasonable resource investment.
- Forest road density is also a limiting factor.
- A detailed economic assessment is needed.

# Improving the forest management techniques

- Policies aiming at Sustainable Forest Management practices.
- Control of the clear cut rates with a special focus on altering the current distribution of forest stands by age class (half of forests are mature and overmature).
- Building incentives to establish forest management on agricultural lands (property rights protection is needed).

# Forest conservation projects

- There were some pioneer forest conservation projects in Russia (Bikin, RUSAL).
- According to the report from Bikin project, its total cost annual cost was $9.9 mln for 400,000 ha, which corresponds to $24.8 per ha in 2010.
- RUSAL project is reported to cost  20 mln RUB per ha in 2020.
- New initiative of “carbon polygons" (incl. 8 planned sites in different regions) needs some further discussion.

# Conclusion

- Despite all the known issues of the actual system of Russian forest carbon budget estimation, there are evident ways to improve the scientific validity of the estimates not compromising the national interest.
- Consensus view of all the parties is that the dataset under the carbon budget estimation must be justified with new data, especially from state forest inventory project.
- Mitigation strategies and projects must be thoroughly and openly discussed and economically evaluated.

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# Thanks for your attention

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