Forest sector accounting, model and scenarios

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EU-RUSSIA MODELLING WORKSHOP FOR DECARBONISATION SCENARIOS
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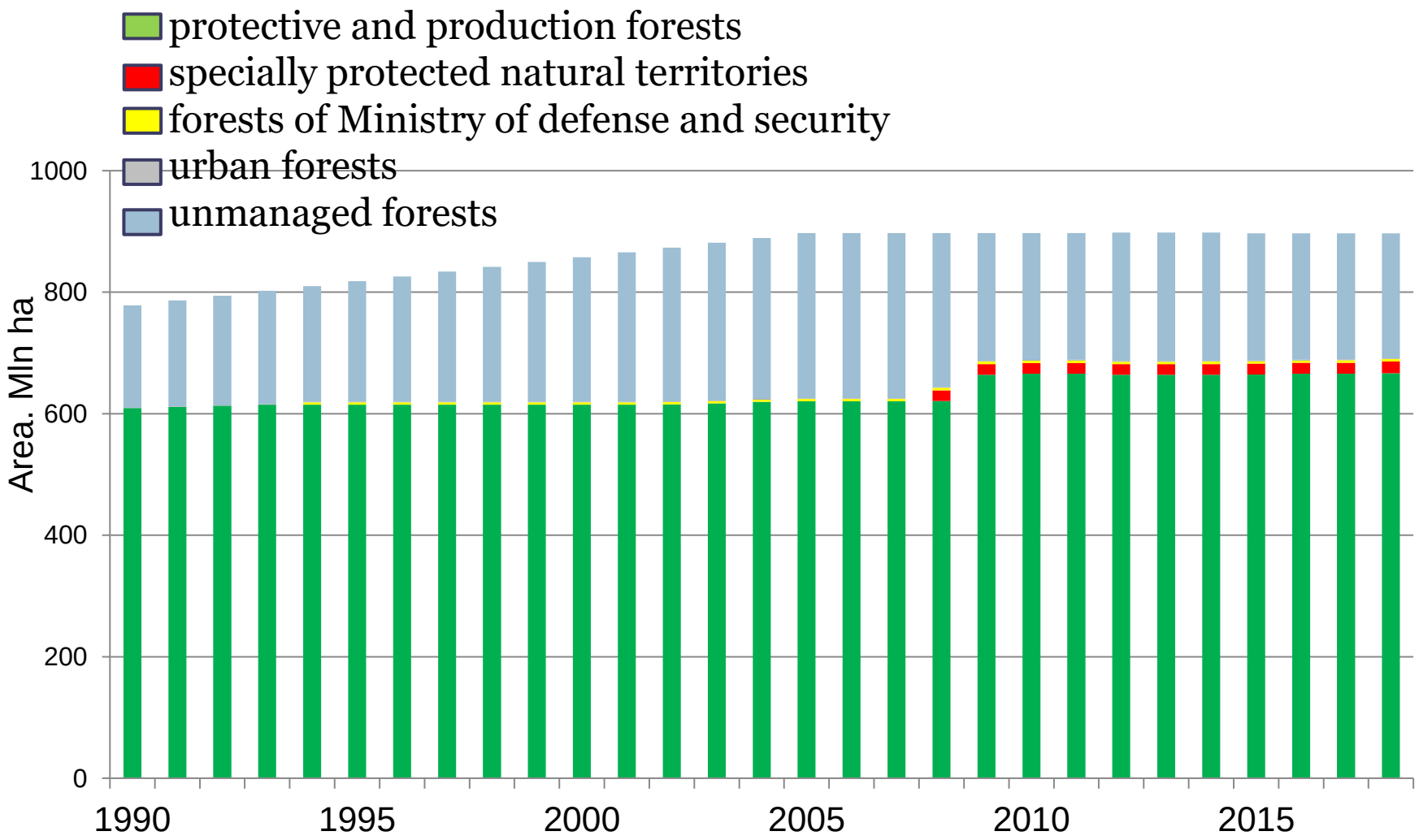
Activity data used in Russian GHG inventory for Forest Lands

- at the regional level based on State Forest Registry (SFR) data provided by the Russian Federal Forestry Agency (once per 5 years for 1990-2008, annually since 2008)
  - disaggregated by dominant species, its age group
  - including bushes (all forests under SFR)
- Data include information on growing stocks, area under species of each age group
- Annual data on disturbances:
  - Burnt area\area of destructive fires
  - Clear-cut area
  - Area of other disturbances

Managed Forest Lands

- The Intergovernmental Panel on Climate Change (IPCC) defines managed land as "… land where human interventions and practices have been applied to perform production, ecological or social functions" (IPCC, 2006)
  - Managed land proxy used to determine which lands are contributing to anthropogenic GHG emissions and removals under UNFCCC
- In Russia managed forests are those, where the focused activities on the use, protection, defense and reproduction of forests are carried out and regulated by national legislation and form the basis of sustainable forest management.
- Within State Forest Registry managed forests are:
  - protective and production forests (except of category Reserve forests)
  - specially protected natural territories
  - forests of Ministry of defense and security
  - urban forests

Managed Forest Lands



In 2018 690,0 mln. ha or 76,9% of total forest lands in Russia

Proportion (%) of managed forest land from the total forest land per regions of Russia

Methods for Forest Lands

- The Regional Forest Carbon Budget Assessment (ROBUL) model used
  - developed by the Center for Forest Ecology and Productivity of the Russian Academy of Sciences (Zamolodchikov et al. 2011, 2013)
  - applies the balance approach, involving the calculation of carbon accumulation and loss as a result of disturbances in the main pools (biomass, dead wood, litter and soil organic matter)
  - calculates carbon absorption by each biomass pool based on current increment (= moving average for each age group)

Current increment as an average carbon absorption for each age group

$$MCPij = CPij / Sij$$

$$MAbPij = (MCPij - MCPi\text{-}1j)/(TIi\text{-}1j + TIij) + (MCPi+1j - MCPij)/(TIij + TIi+j)$$

$$AbPij = SijMAbPij$$

where:

MCPij – average carbon stock of stand biomass of age group i and dominant species j, tC ha -1 ;

CPij – carbon stock of stand biomass of age group i and dominant species j, tC ha-1 ;

Sij – stand area of age group i and predominant species j, ha;

MAbPij – average annual carbon absorption by stand biomass pool of age group i and dominant species j, tC ha-1 year-1;

MCPi-1j – average carbon absorption by stand biomass pool of age group i-1 (preceding the age group i) and dominant species j, t C ha-1;

TIij – time interval of age group i and dominant species j, years;

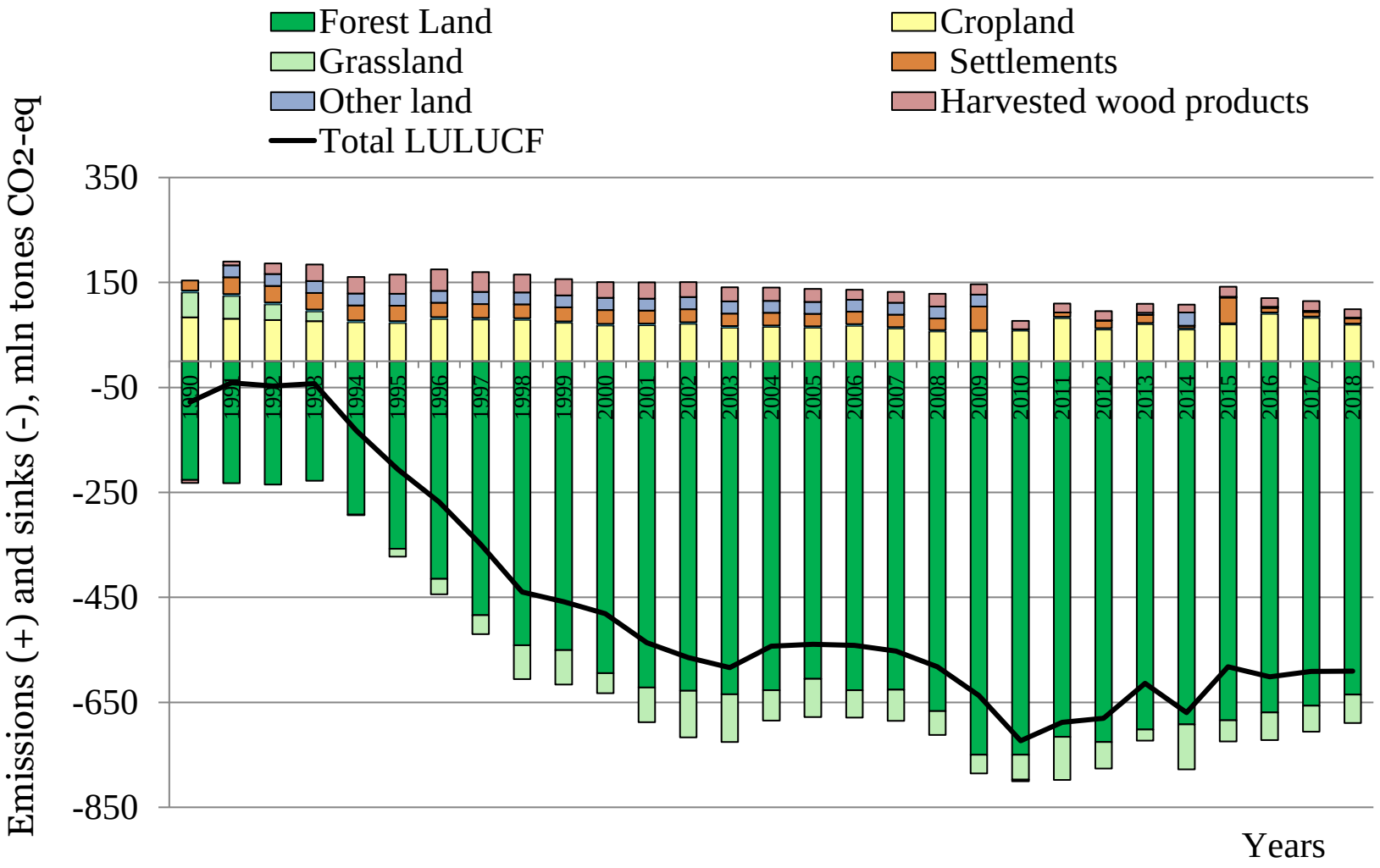
TIi-1j – time interval of age group i-1 and dominant species j, years;

MCPi+1j – average carbon stock of stand biomass of age group i+1 (following the age group i) and dominant species j, tC ha-1 ;

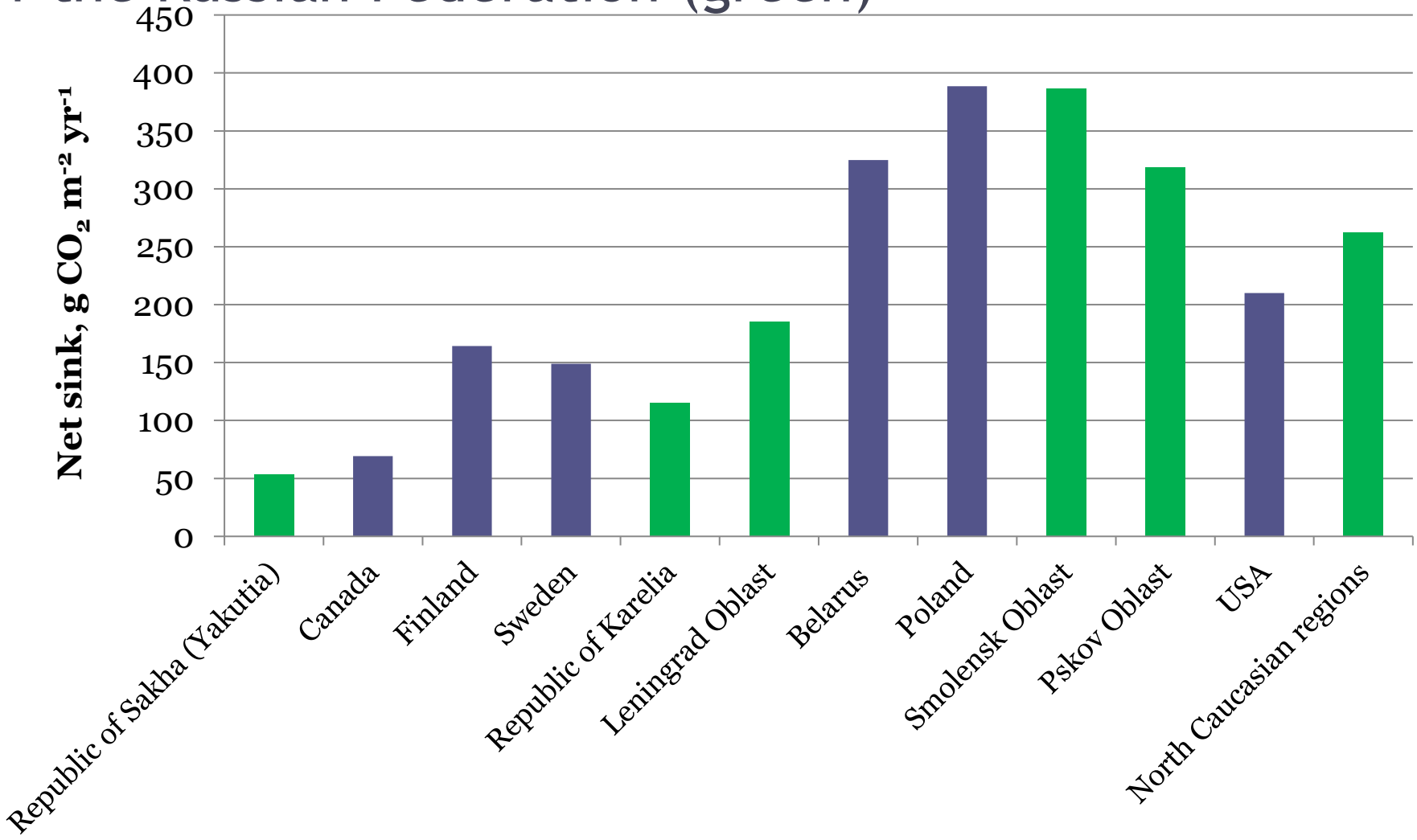
TIi+j – time interval of age group i+1 and dominant species j, years;

AbPij – annual carbon absorption by stand biomass pool of age group i and dominant species j, tC year-1

Results (LULUCF sector)



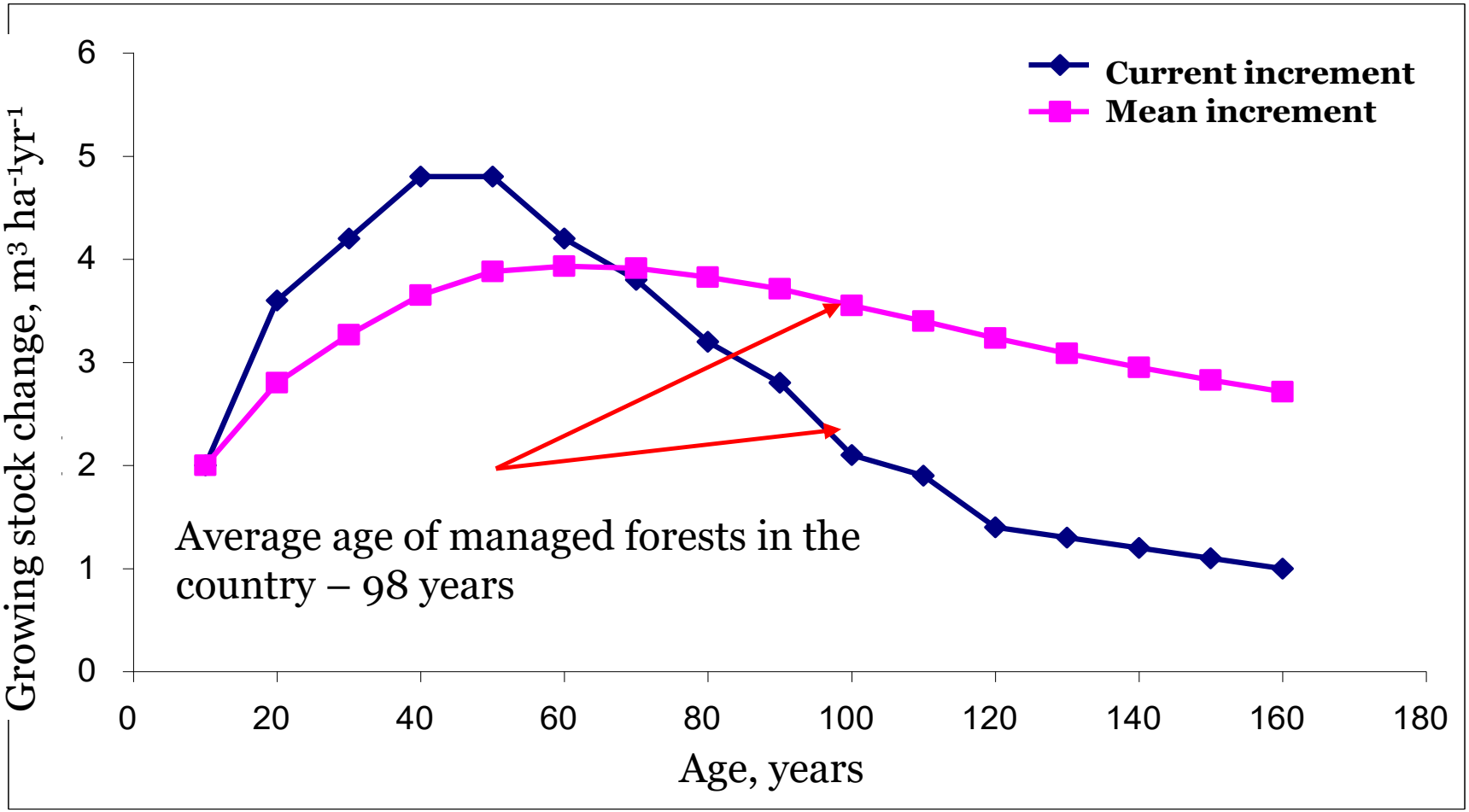
Net CO_2 removals per area in managed forests of developed countries (blue) and relevant regions of the Russian Federation (green)



Popular criticism of forest methodology in GHG inventory

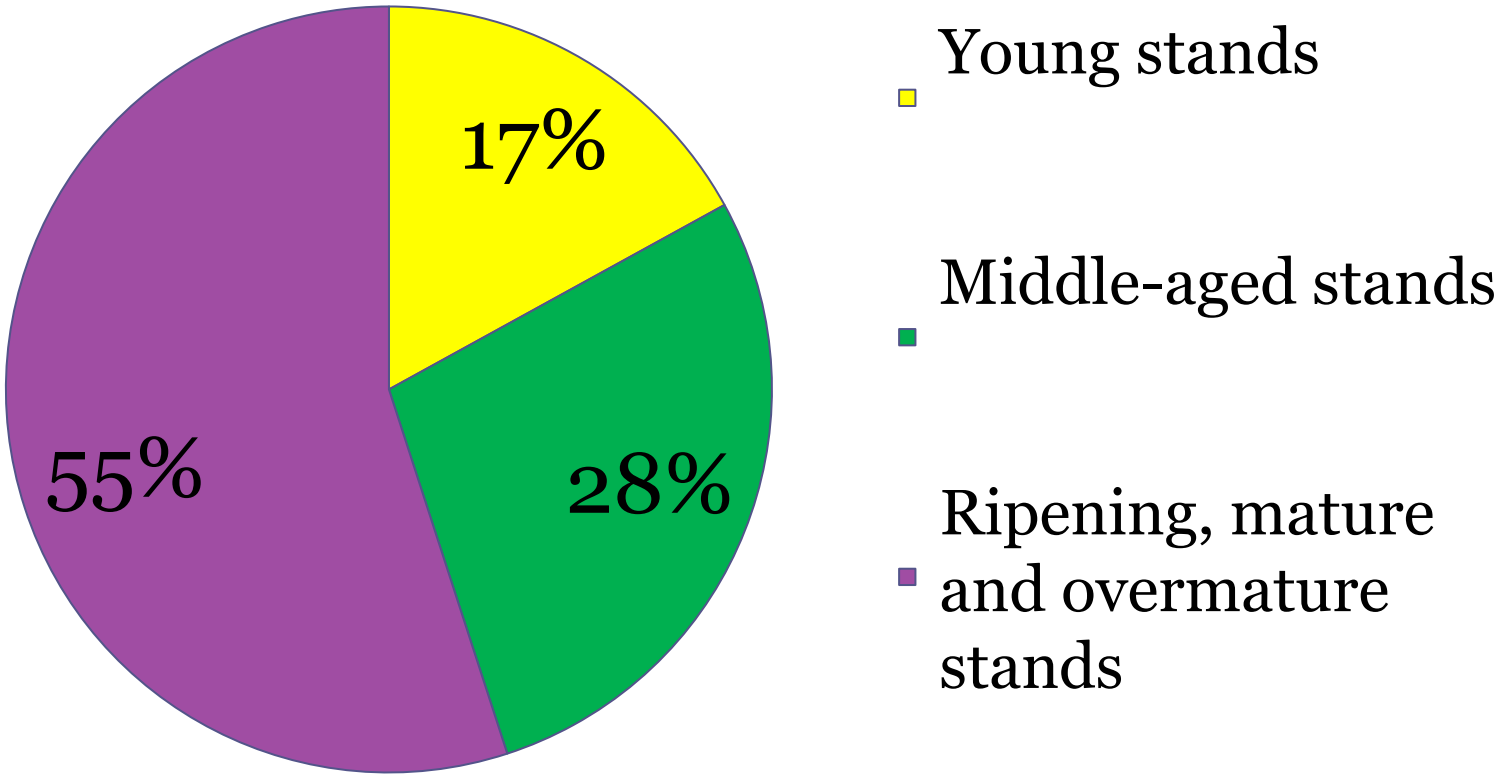
- “Alternative” methodology (Fillipchuk et al, 2018)
- Based on the mean increment of the growing stock (one mean value for stand life= total carbon stock of the tree/years of its lifetime)
- Not in line with 2006 IPCC Guidelines as does not consider subdivision by age groups/classes
- However gives approximately twice higher numbers for carbon sink in Russian forests

Current increment versus mean increment

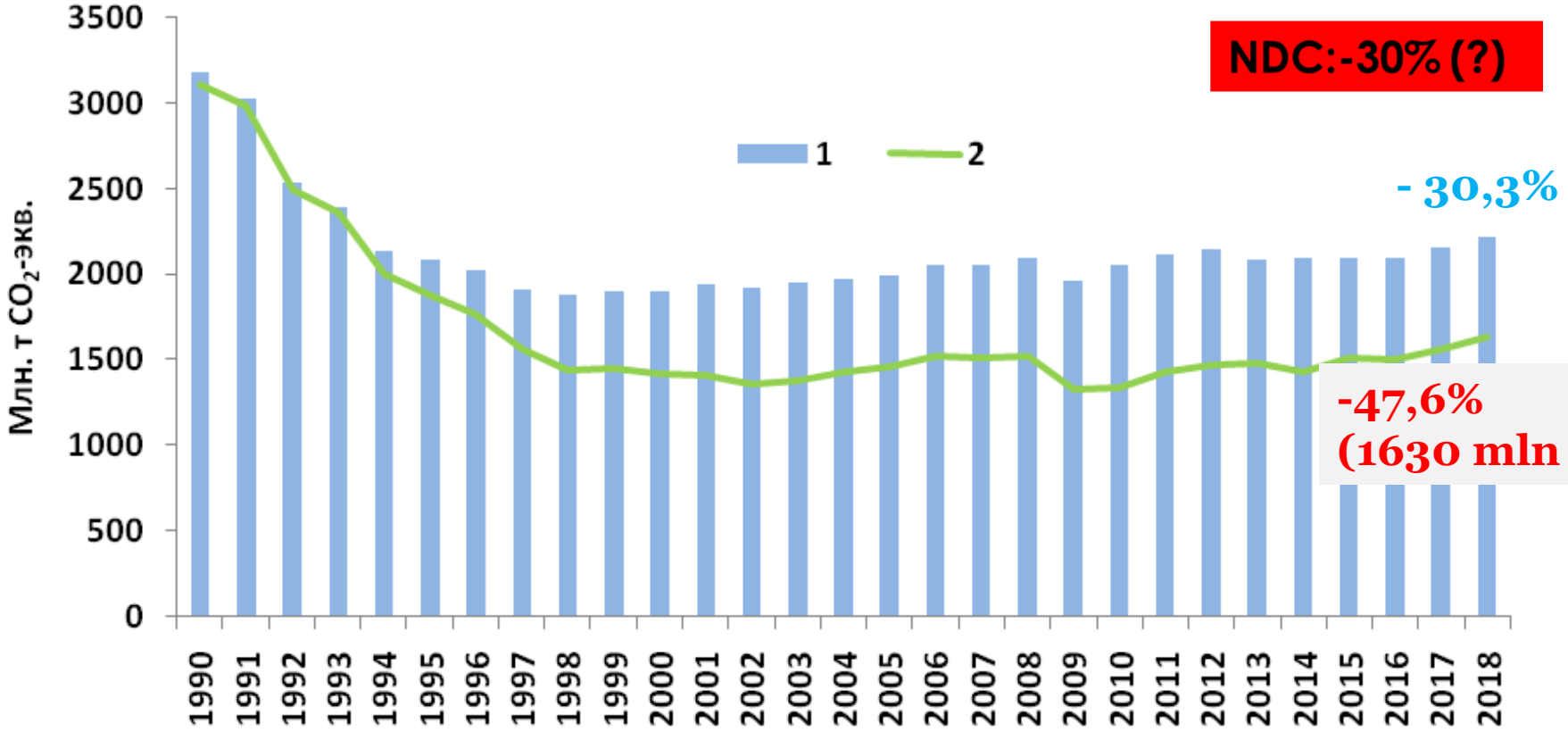


Forest age structure

Age structure of managed forests



Results (National GHG inventory)



1 – without LULUCF
2 – with LULUCF

LULUCF compensates 26,6% of the total national emissions in 2018 (590,6 mln t CO2 eq)

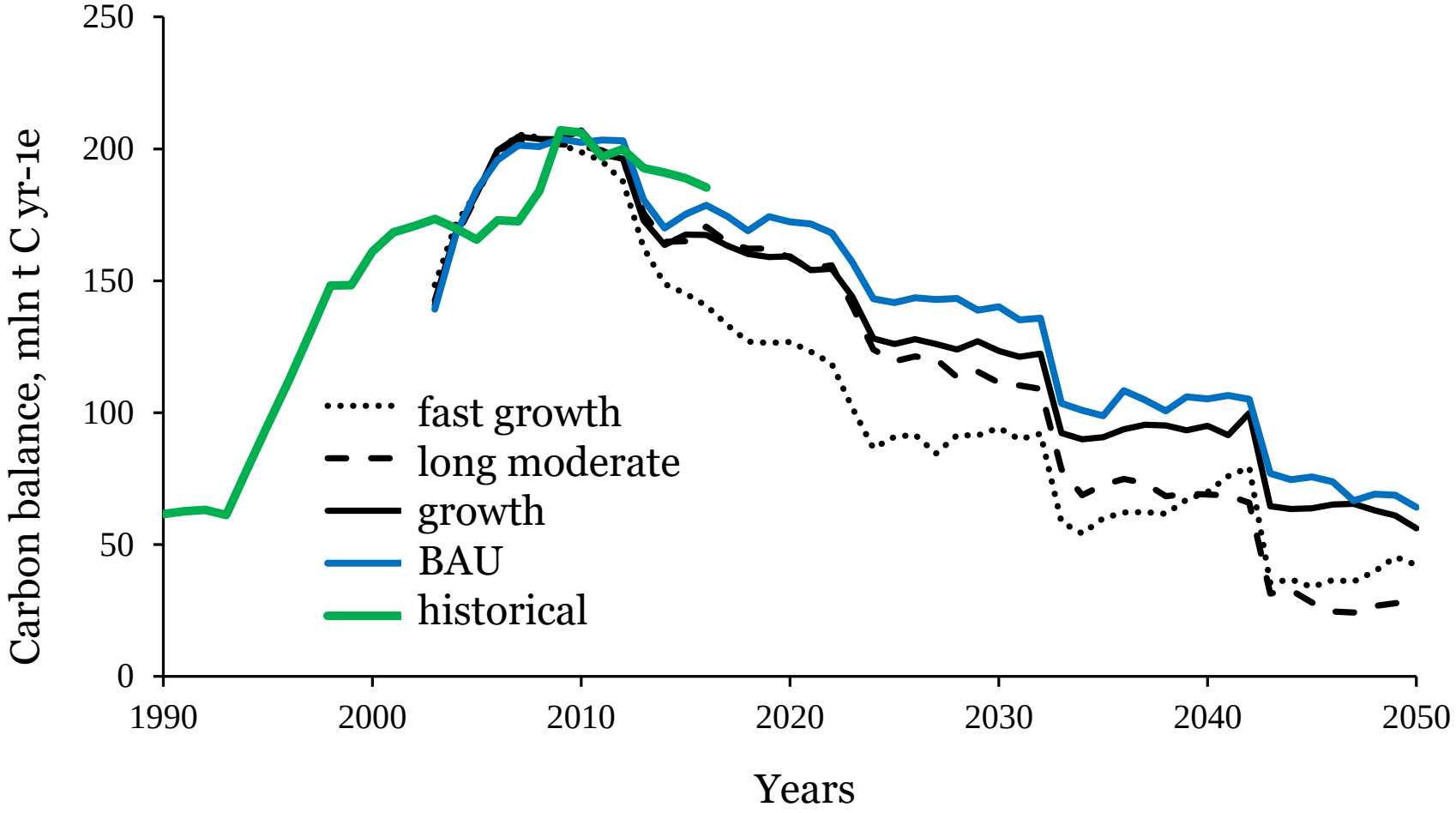
Mitigation potential in land sector of Russia

Mitigation measures	Mt CO_2-eq\yr
Prevention of forest fires	220-420
Gentle logging technology	15-59
Reduction of wood losses	61-76
Improve reforestation (replace conifer monocultures with mixed stands)	50-70
Prevention of fires on grasslands	0,5-1,5
Prevention loss of soil carbon in arable land	101-159
Potential accumulation of carbon in the soils of grasslands	13-19
Measures to reduce nitrogen leaching of applied mineral and organic fertilisers	4-8
Rewetting of dried wetlands	0,1-0,3
Reduction in exports of round wood and the switch to export of processed wood products	17-26
Increasing paper recycling and carbon storage in long-lived HWP	51-79
Afforestation for compensation of deforestation	0,2-0,4
Land reclamation	13-19

Total ~ 545–940 Mt CO_2-eq\yr

ref.: Romanovskaya et al., 2019

Scenarios (by harvesting volume)

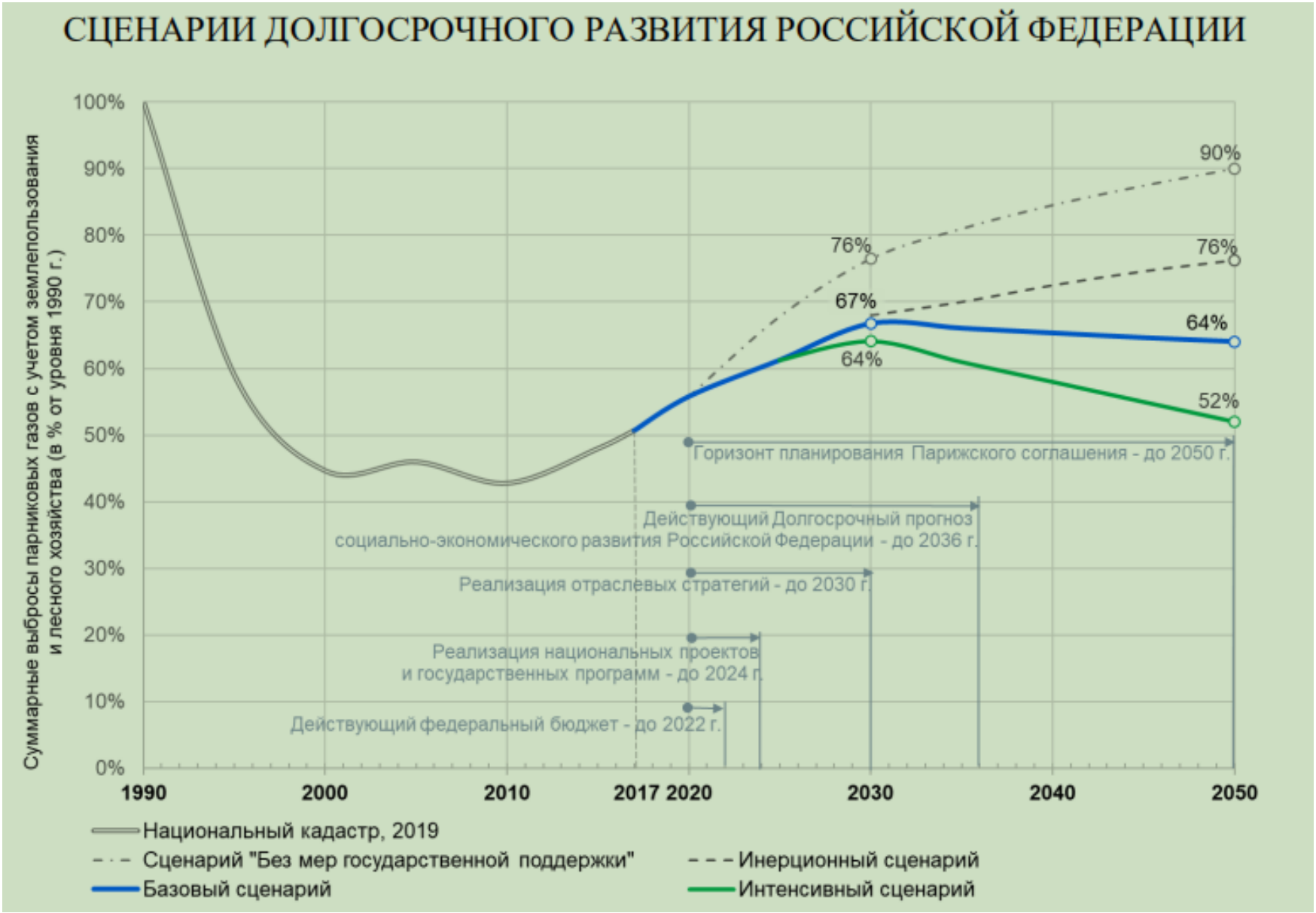


by (Zamolodchikov, Grabovsky, 2014) CBM-CFS3 modelling and historical by ROBUL

Alternate scenario -IGCE

Indicators	Sinks (-) / emissions (+), mln. t CO_2-eq. yr^{-1}			
	1990	2008-2017	2035	
			basic	strategic
C absorption with losses	-1024	-1232	-1200	-1200
Emission CO_2 from clearcuts	447	258	483	558
Emissions CO_2 from fires and etc.	345	292	67	33
Emission CH_4 and N_2O from fires	20	22	14	8
Emissions CO_2, CH_4 and N_2O from drainage	9	7	0	0
TOTAL	-204	-652	-636	-601

GHG long-term scenarios



Draft of the Low Carbon Long-Term Strategy of the Russian Federation

- Absorption reduction after 2020 seems to be overestimated compared against data by Zamolodchikov&Grabovsky, 2014(-332 mln t C up to 2030)
- Not clear how prevention of forest fires is included
- Basic scenario does not include any other forest measures (no afforestation, reduction of wood losses during timber processing, gentle logging procedures etc.)
- So, mitigation in forestry seems to be significantly underestimated
- Need substantial revision: both scenarios and NDC

Thank you!