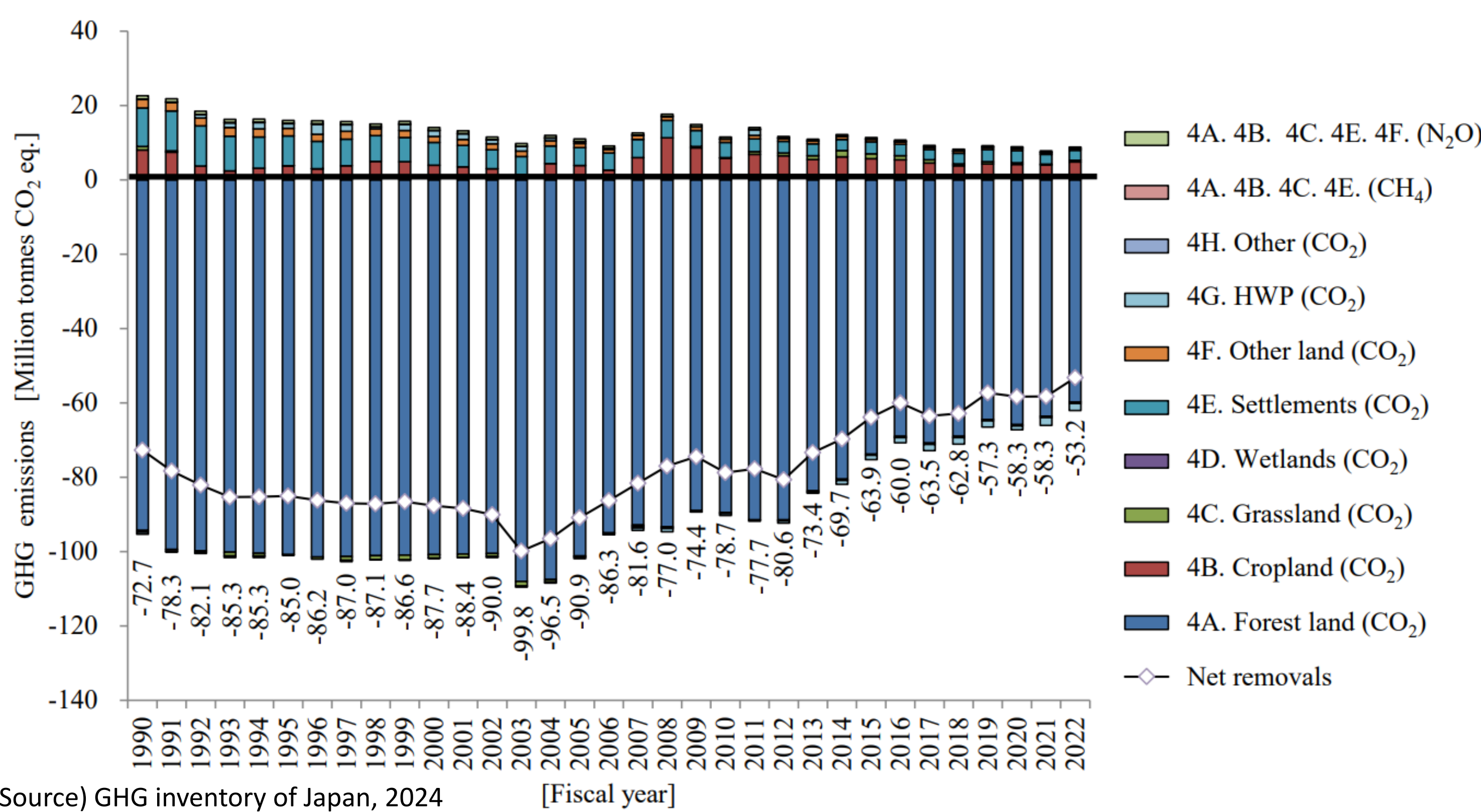


# Overview of Japan's LULUGF GHG inventory

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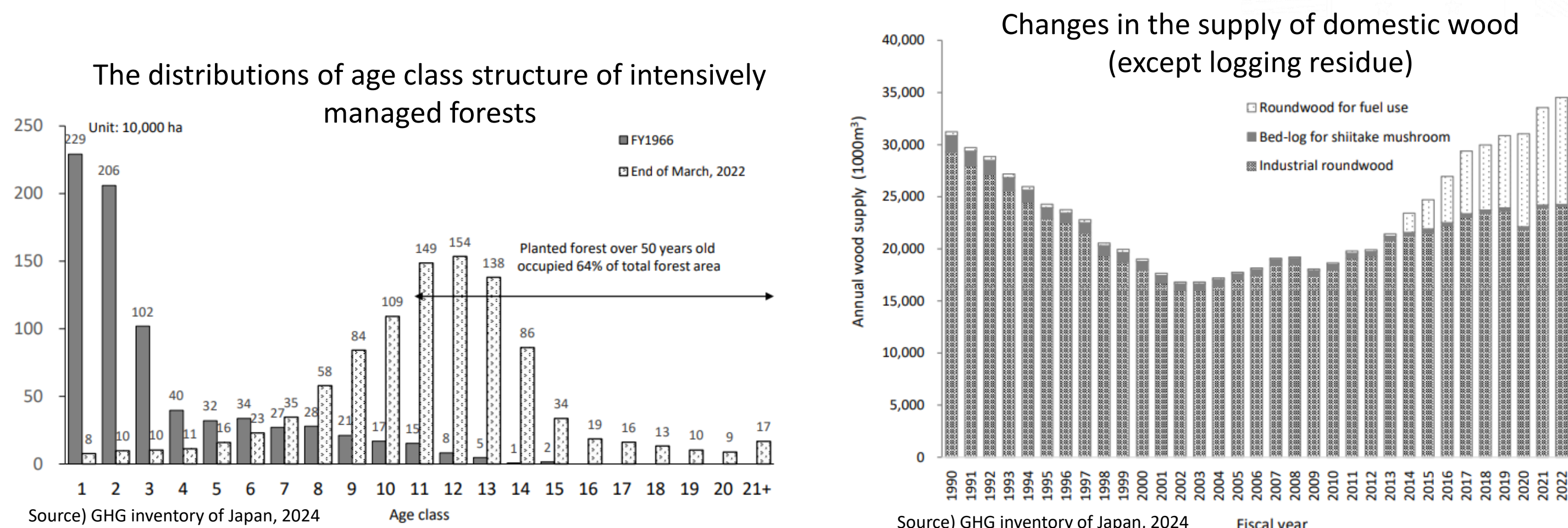
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(Japanese LULUCF GHG inventory compiler)

## 1. GHG emissions and removals trend in the LULUCF



### Feature and key drivers related to the LULUCF sector in Japan

- Net CO<sub>2</sub> removals which offset 4.7% of the national total GHG emissions in 2022.
- Forest area has been almost stable over 100 years (2/3 of national land).
- Main LUC is conversion to settlements. LUC area has been decreasing over time.
- Lower organic input into agricultural soils than those implemented in 1960's-70's.
- Uneven forest age class structure and increasing domestic wood supply.

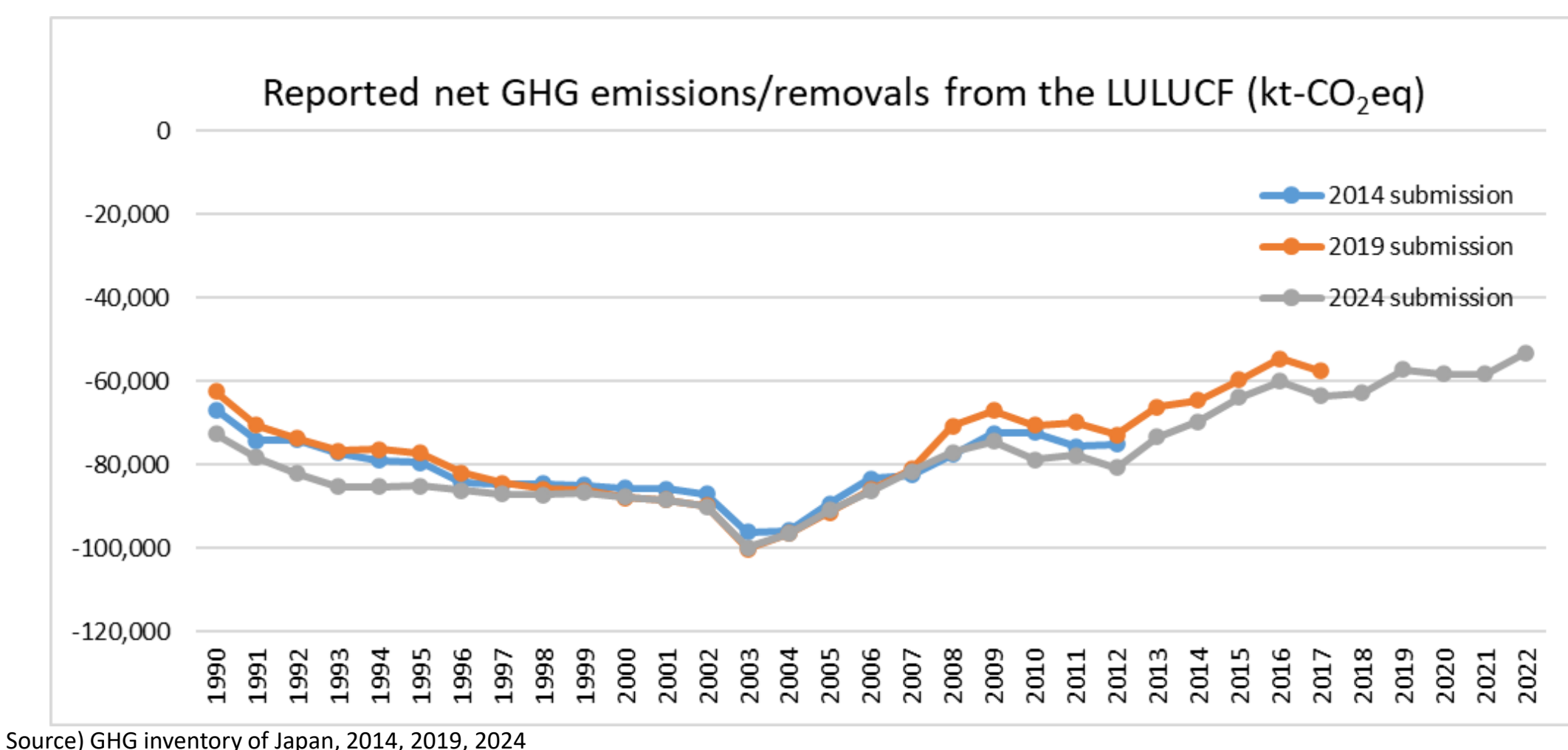


## 2. Methodologies applied

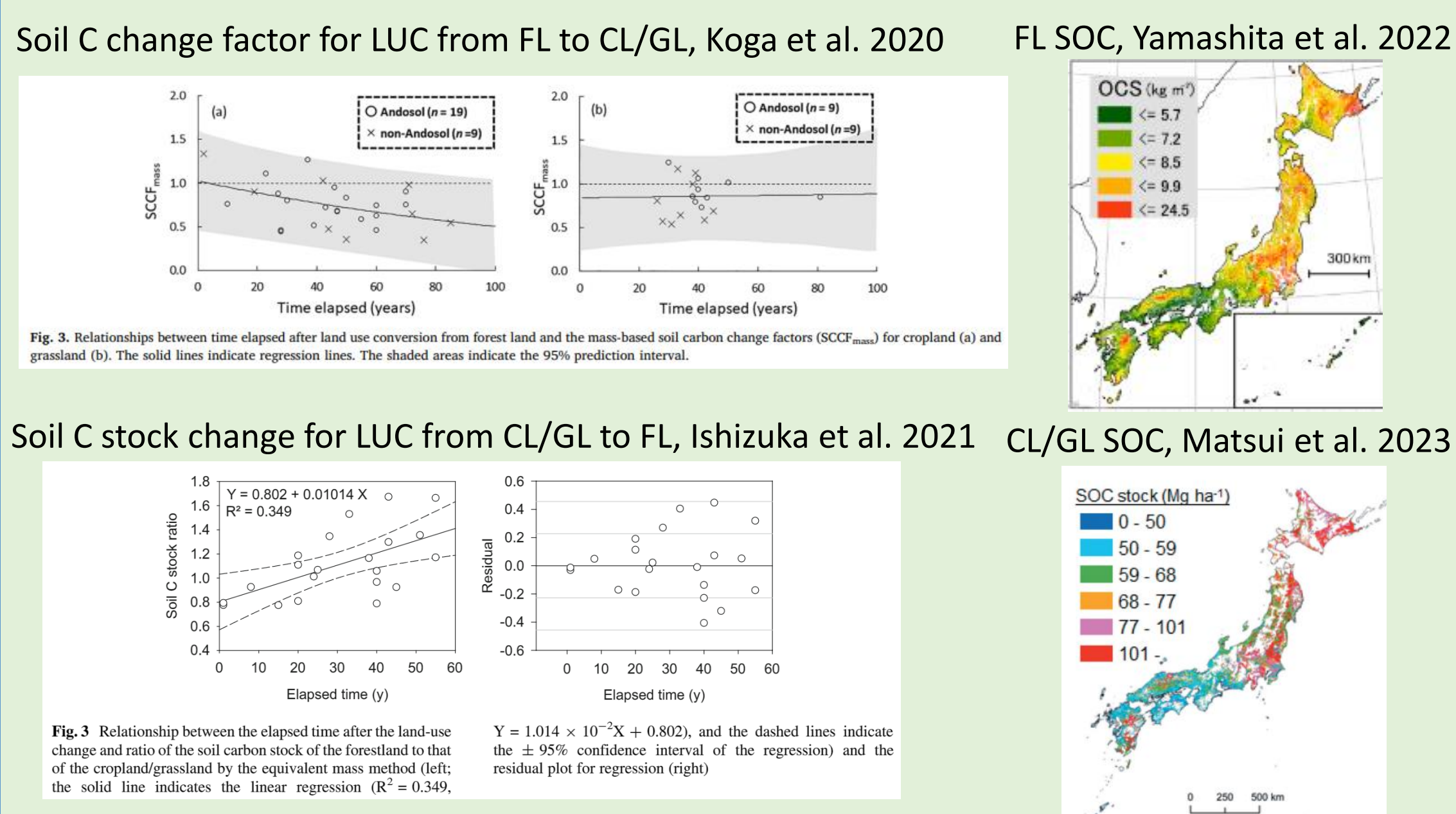
Item	Methods	Notes
Anthropogenic GHG emissions and removals	MLP	All national territories are regarded as managed land.
Assessment of mitigation efforts in the LULUCF (NDC)	Activity-based accounting. Narrow approach (for intensively managed forest and revegetation).	The LULUCF contribution for the emission reduction targets (KP, 2020, 2030) were activity-based accounting.
Land representation	Hybrid of various land use data.	Statistics, GIS map, remote-sensing since 1951 (LUC between FL-CL) or 1971 (other LUCs) or 1990 (Land area).
Use of remote sensing	Detecting land area and LUC.	ARD assessment, some raw data of LU.
FL - biomass CSC	Advanced stock-difference method using forest stocks based on yield tables and forest inventory based data base.	Improvement work of including new NFI data is ongoing.
FL - DOM and soils CSC	Tier 3 CENTURY-jfos model run under a standard forest management condition.	Improved in 2024 by updating some parameters reflecting new NFI data.
LUC - biomass and DOM CSC	Tier 2 with CS parameter in each land use.	CS values available for biomass - FL, CL and DOM - FL.
LUC - mineral soils CSC	Tier 2 with CS SOC, carbon factors and transition periods.	Developed CS values based on national research project.
CL - orchard biomass CSC	Stock-difference methods using statistics area and CS stock values taken from various papers.	Estimated under 15 types orchard at 47 prefectures level. GHG from burning is also estimated together.
CL, GL - mineral soils CSC	Tier 3 Roth Model adjusted by long-term field survey in Japan. 4 sub land use classes - rice field, upland field, orchard and pasture.	Summary is given in the 2019 RM. C input data estimation method has been updated several times.
CL, GL - organic soils GHG	Tier 1/2 with some CS-CO <sub>2</sub> -EF (tillage frequency is also considered for pasture).	Using 1992, 2001, 2010 soil distribution data in rice field, upland field, orchard and pasture.
WL - peat extraction	NE - Insignificant.	Negligible level of activities.
WL - flooded land	NE - Under investigation.	Checking 2500 reservoirs status.
WL - mangrove CSC	Tier 1/2 based on CS-papers and survey on mangrove.	Non-forest mangrove is reported here.
WL - seagrass meadows and macroalgal beds carbon sequestration	Tier 3 CS ecosystem model assessing long-term carbon sequestration impact in each export processes.	Very new concept for GHG inventory estimation. Carbon sequestered more than 100 years are estimated.
SL - urban greening biomass CSC	Tier 2 with CS removal factor and CS actual growing period.	AD is based on government data. CS parameters are developed based on survey/research in urban parks etc.
SL - urban greening DOM soil CSC	Tier 2/3 simplified method with CS C accumulation ratio due to greening.	
Mineralisation	Tier 2 with CS C:N ratio as well as CS parameters from academic research.	A consistent method applied for Ag and LULUCF-CL-GL.
Biomass burning	Tier 1/2 with CS burning amount data.	Emission from biomass burning is not dominant in Japan.

## 3. History of the improvements made for the LULUCF GHG inventory of Japan for last 10 years

- GHG estimation methods have been updated over time and the accuracy is considered to have improved. Some improvements are academic-driven, others are policy-driven.
- We can't take in knowledge we don't know and data we don't collect into GHG inventory. Communication among policy-maker, compiler and scientific community is important.



### Example of academic research used for improvement



### History of the improvements made for the LULUCF GHG inventory of Japan for last 10 years

Submissions	New estimations	Major revisions	Minor revisions
2015 (1 <sup>st</sup> reporting year of KP-CP2 by using 2006GL and 2013KPSG)	CSC of agricultural soils by introducing Roth C model. CSC of HWP - Tier 3 stock inventory method. CSC of orchard biomass and its GHG from burning. Off-site CO <sub>2</sub> and CH <sub>4</sub> emissions from organic soils (drainage). N <sub>2</sub> O emissions from mineralization other than LC. Indirect N <sub>2</sub> O emissions from fertilization and mineralization.	Update of carbon fraction of forest based on CS data. Introduction of new biomass CS removal factor and extend growing period for a part of urban forest. Reallocation of lime application (from LULUCF to Agriculture). Change of GWP (from AR2 to AR4).	Update of a parameter used for deforestation area estimation. Update of CO <sub>2</sub> EF for orchard and pasture land organic soils. Reallocation of set-aside land (from OL to CL).
2016		Introduction of new CS removal soil factor and extend growing period for a part of revegetation.	Update of N <sub>2</sub> O EF (consistent with Agriculture sector)
2017			Update of carbon fraction of herbaceous biomass (from GPG-LULUCF to 2006GL). Update of HWP CSC about deforestation contribution estimation.
2018	GHG from biomass burning on grassland.	Update of ARD area estimation by revising of data (from SPOT5 to SPOT6/7).	Update of HWP CSC about C outflow from buildings. Update of frequency of organic soils cultivation on pasture land (consistent with Agriculture sector).
2019		Update of ARD area estimation by improving time series construction.	Update of orchard biomass CSC by including additional fruit types. Update of area of organic soils associated with LUC.
2020	Biochar application into agricultural soils. CO <sub>2</sub> emissions from organic soils in settlements.		Update of CS parameter of cropland biomass. Correct error of calculation.
2021		Introduction of new soil distribution data for agricultural land (year of 2010) and reassessed area of mineral/organic soils. Update of Roth C model for agricultural soils by updating C input assumption methods.	Correct error of calculation.
2022			Update of the way of addressing national land area increase. Update of N <sub>2</sub> O EFs from 2006GL to 2019RM. (consistent with Agriculture sector).
2023 (1 <sup>st</sup> reporting year after KP-CP2)	CSC of non-forest Mangrove (blue carbon).	Update of yield tables for major trees of private forest. Introduction of new CS soil carbon factors associated with LUC and update of old LUC data. Update of CS DW and LT stock value of forest. Introduction of new biomass CS removal factor and extend growing period for a part of urban forest.	Update of carbon fraction for bamboo biochar by CS data.
2024	Carbon sequestration from seagrass meadows and macroalgal (blue carbon).	Update of yield tables for major trees of private forest (cont.). Update of CENTURY-jfos model for forest soils and DOM. Change of GWP (from AR4 to AR5)	Update of HWP CSC such as using old production data instead of default assumption.

Recalculation impacts: red >1,000 kt-CO<sub>2</sub>e./yr, blue: 100-1,000 kt-CO<sub>2</sub>e./yr, black: <100 kt-CO<sub>2</sub>e./yr