
AFOLU relevant AIM global model's activities

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AIMWS

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AFOLU activities

- AFOLU national emissions pathways
- AgMIP
 - ✓ AIM proposes a new study on Ozone impact on food security
Xia Shujuan
Kazuaki Tsuchiya
 - ✓ New exercise starts as EAT-Lancet framework
- Biodiversity
 - ✓ Bending the curve phase 2
Tomoko Hasegawa,
Kazuaki Tsuchiya
 - ✓ BESSIM2
 - ✓ MOEJ-IIASA project
Kazuaki Tsuchiya

AFOLU national emissions pathways

Background

- Over 150 countries are adopting net zero targets. Yet, national-level AFOLU mitigation strategies are not well developed.

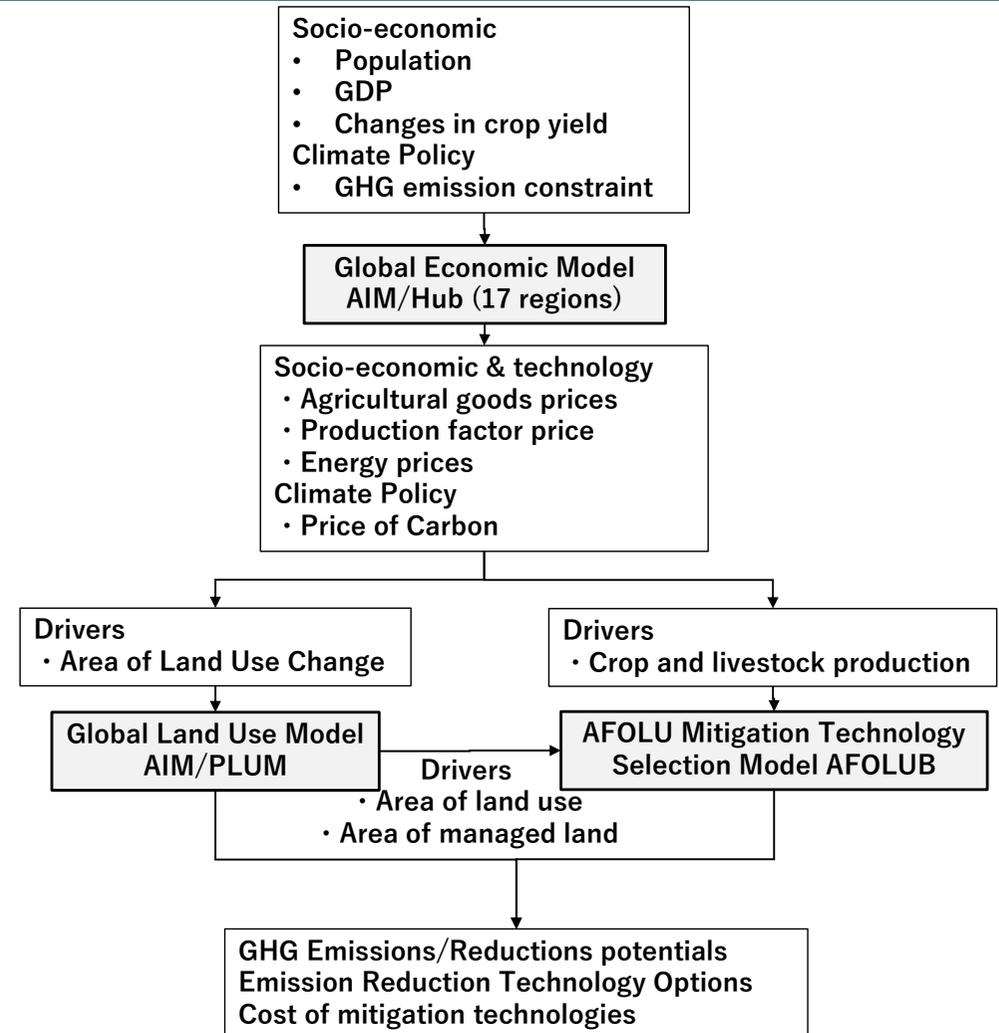
Objective

- We developed national AFOLU mitigation pathways with a detail mitigation option portfolio.

Method

- AIM/Hub – PLUM – AFOLUB models
- More than 100 countries

Method overview



AgMIP multi-model comparison study: ozone impacts on food

Background

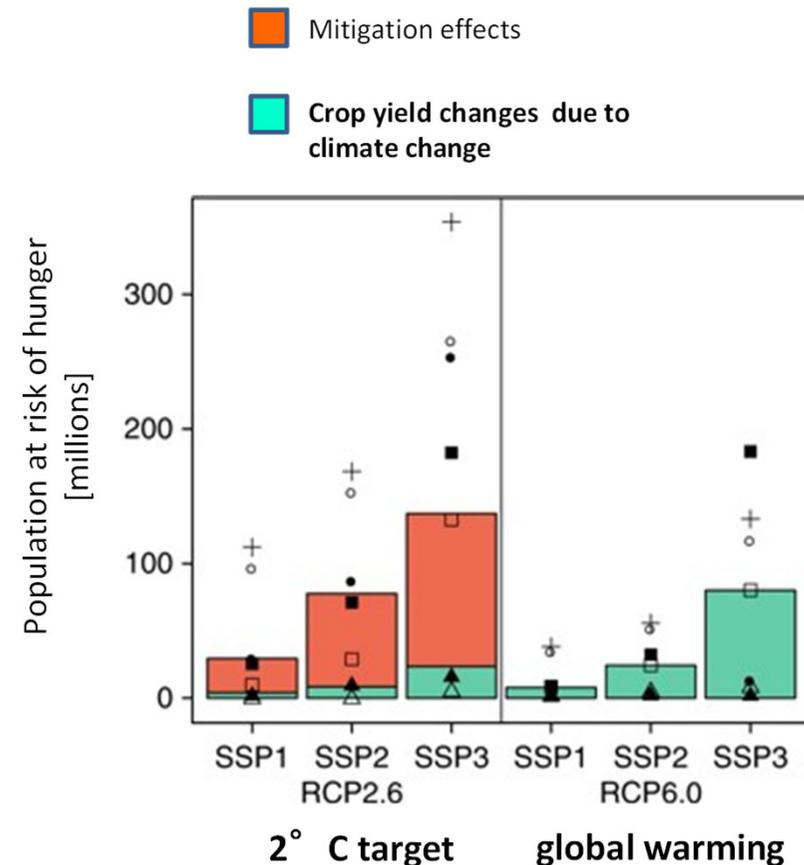
- Earlier studies have raised **food security concern under climate mitigation but have not considered the impacts of reduced ozone pollution** that could increase crop production and improve food security.

Research Question

- How much **benefit does reduced ozone concentration** through climate mitigation bring to global food security?

Method

- multi-model intercomparison: Five IAMs



Hasegawa et al. (2018)

RESEARCH

BIODIVERSITY LOSS

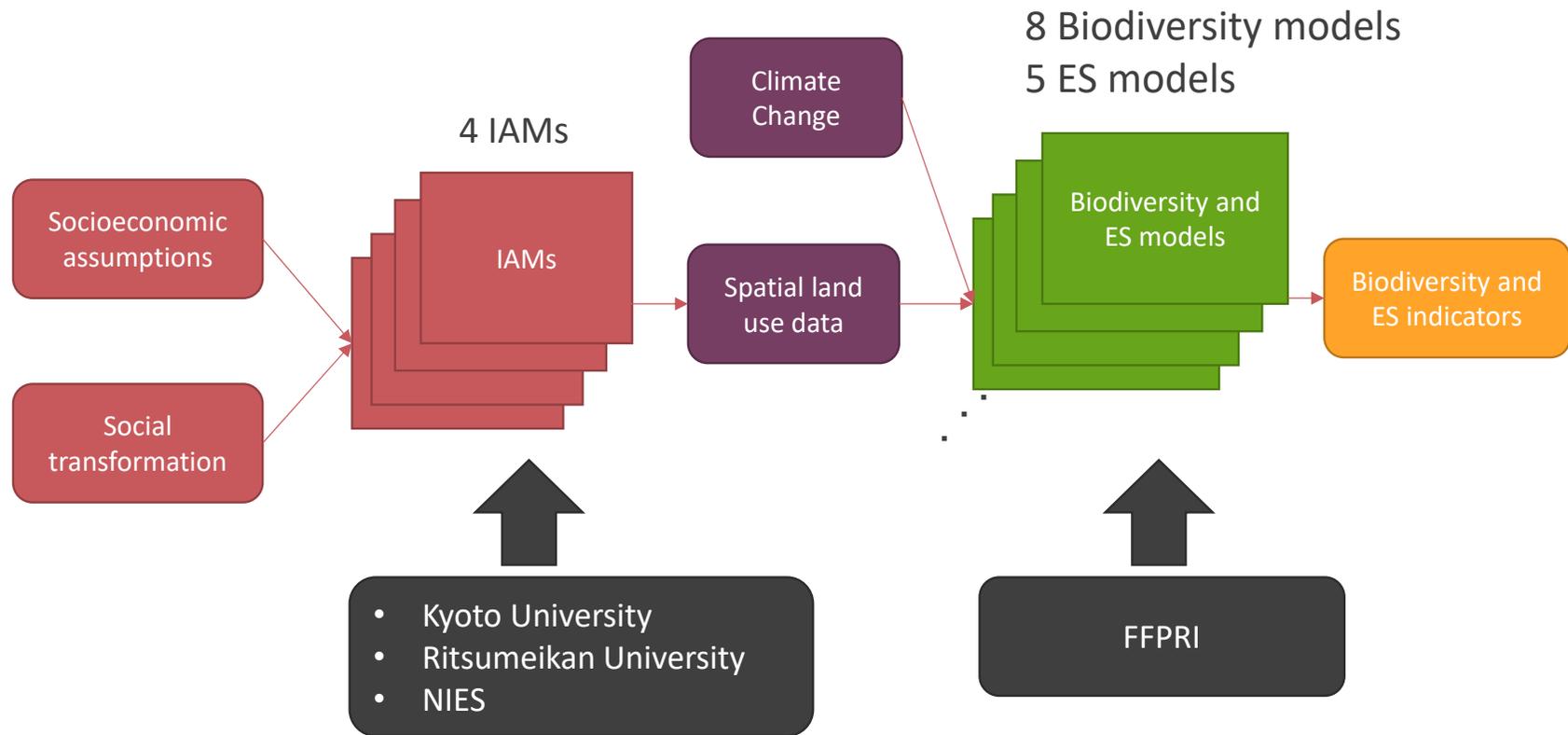
Global trends and scenarios for terrestrial biodiversity and ecosystem services from 1900 to 2050

Henrique M. Pereira^{1,2,3*}, Inês S. Martins^{1,2,4}, Isabel M. D. Rosa^{1,2,5}, HyeJin Kim^{1,2,6}, Paul Leadley⁷, Alexander Popp^{8,9}, Detlef P. van Vuuren^{10,11}, George Hurtt¹², Luise Quoss^{1,2}, Almut Arneth¹³, Daniele Baisero^{14,15}, Michel Bakkenes¹⁰, Rebecca Chaplin-Kramer^{16,17}, Louise Chini¹², Moreno Di Marco¹⁴, Simon Ferrier¹⁸, Shinichiro Fujimori^{19,20}, Carlos A. Guerra^{1,21}, Michael Harfoot²², Thomas D. Harwood^{18,23}, Tomoko Hasegawa^{20,24}, Vanessa Haverd¹⁸, Petr Havlik²⁵, Stefanie Hellweg²⁶



Global biodiversity trends

Methodology



Biodiversity impacts duri

- The study revealed changes in biodiversity and ecosystem services over a 150-year period, from the past to the future, using multiple models and indicators.
- During the 20th century, globally:
 - Biodiversity decreased by 2-11%
 - Ecosystem regulating services decreased, such as pollination and nutrient retention

(a)

Biodiversity Indicators:

- $\Delta S\gamma$: Global and continental species richness
- $\Delta S\alpha$: Local scale species richness (approximately 50km grid level)
- ΔHt : Global and continental habitat suitability area for each species
- $\Delta I\alpha$: Local scale biodiversity intactness

Pereira et al. 2024

Biodiversity impacts duri

- Future

- ✓ Climate change have significantly reduced biodiversity.
- ✓ Measures aimed at sustainable development can mitigate the loss of biodiversity.
- ✓ Without these measures, land development and climate change will continue to result in biodiversity loss.
- ✓ This underscores the importance of efforts toward sustainable development.

(a)

Biodiversity Indicators:

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Pereira et al. 2024

Another biodiversity study with MESSAGEix-GLOBIOM

“Bending the Curve” study (Leclere et al. 2020)

Article

Bending the curve of terrestrial biodiversity needs an integrated strategy

<https://doi.org/10.1038/s41586-020-2705-y>

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 Check for updates

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Increased efforts are required to prevent further losses to terrestrial biodiversity and the ecosystem services that it provides^{1,2}. Ambitious targets have been proposed, such as reversing the declining trends in biodiversity³; however, just feeding the growing human population will make this a challenge⁴. Here we use an ensemble of land-use and biodiversity models to assess whether—and how—humanity can reverse the declines in terrestrial biodiversity caused by habitat conversion, which is a major threat to biodiversity⁵. We show that immediate efforts, consistent with the broader

- Establishing stylized biodiversity conservation scenario
- Land use impacts on biodiversity
- Main results are based on SSP2-ref (without additional mitigation effort)

+ Climate change mitigation,
energy and GHG emission parts

**MOEJ-IIASA Part B / Phase 2.1: interactions
between climate policies and biodiversity**

AIM (Hub, PLUM, BIO)

MESSAGEix-GLOBIOM

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Thank you for your attention