

SUPREMA GLOBIOM-MAGNET Training

December 4, 2020

GLOBIOM regional and country level modeling

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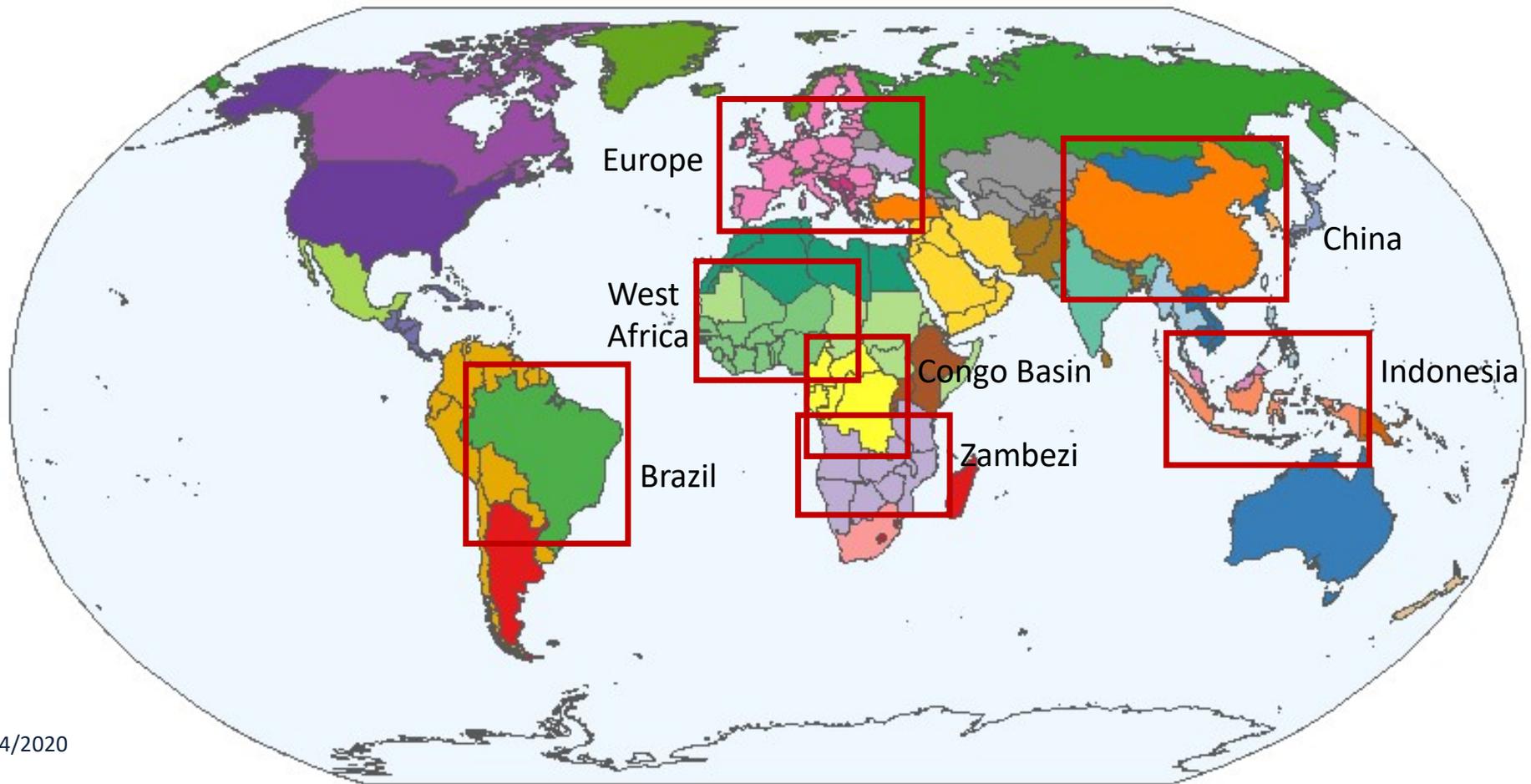
This project has received funding from the European Union's
Horizon 2020 research and innovation programme under grant
agreement No 773499 SUPREMA.



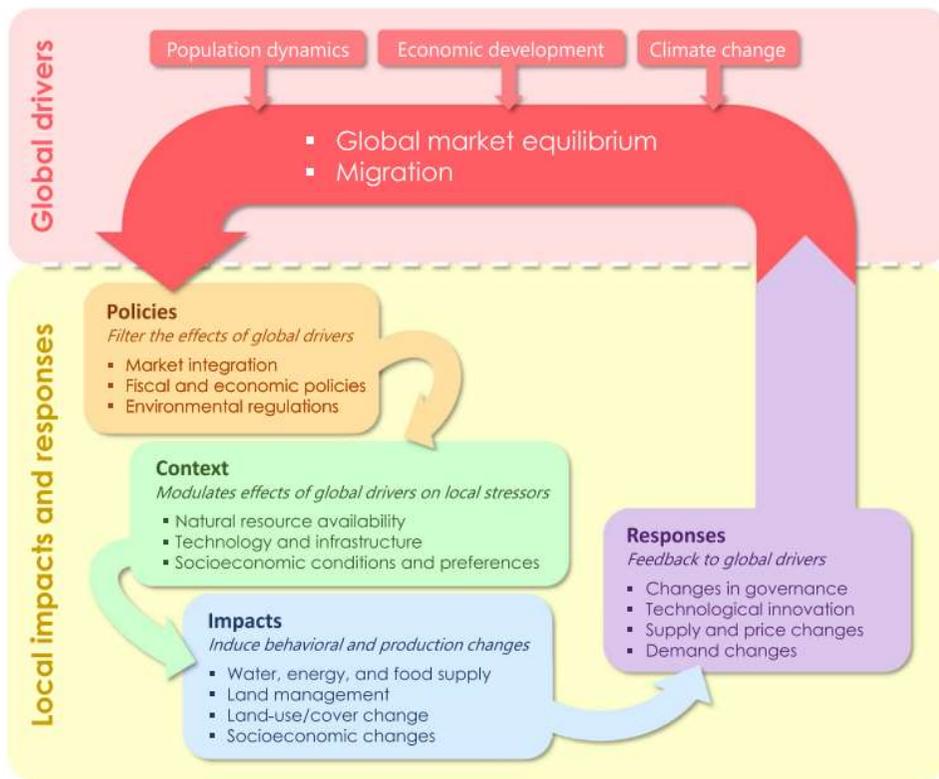
GLOBIOM: Global to local applications

- Where have we done detailed regional and country modeling?
- How can adapting a global scale model for country and regional modelling help us to understand the local context?
- What are our objectives with country and regional modeling?
- How can we adapt GLOBIOM to improve the local context?

Where have we done detailed regional and country modeling?



How can adapting a global scale model for country and regional modeling help us to understand the local context?



- Global to local to global
- Global change (climate and socioeconomic)
- Trade as adaptation to local/global policies/impacts
- Leakage effects
- Global coverage for input data
- Balancing computational effort and timing with detailed representation of local dynamics

What are our some of our objectives with regional and country level modelling?

- Participatory approaches to co-develop with local stakeholders
 - Enhance two-way capacity development
- Improve model representation of local context
 - Scalability to global or more local
- Context-specific policy impacts
- Transboundary water-energy-land nexus

GLOBIOM-CCAFS-West Africa



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Objective: Build a range of scenarios tools to visualize/engage with different, plausible futures for agricultural development



- Bringing “the right people together” across sectors, disciplines, interests; relying on extensive regional network
 - Develop narratives storylines through conceptual maps and backcasting, expressed through words and images
 - Identify relevant drivers of change and indicate future trends
 - Quantify scenarios using agricultural economic models to see interacting impacts to compare the relative differences across a range of economic, social, and environmental indicators

Palazzo et al. 2017. “Linking regional stakeholder scenarios and shared socioeconomic pathways: Quantified West African food and climate futures in a global context.” *Global Environmental Change*. <http://dx.doi.org/10.1016/j.gloenvcha.2016.12.002>

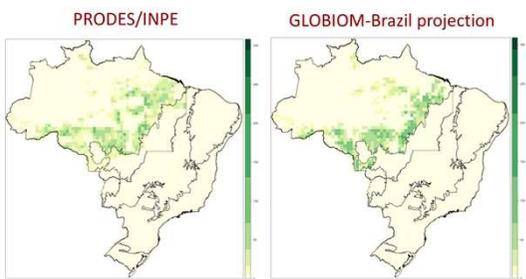
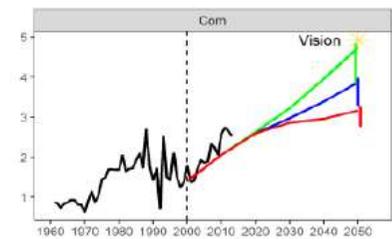
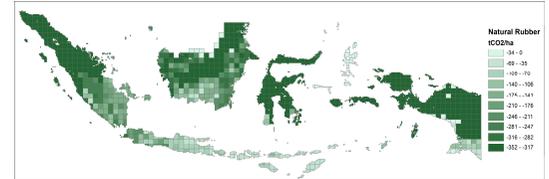
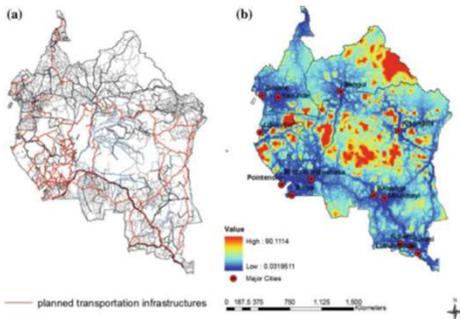
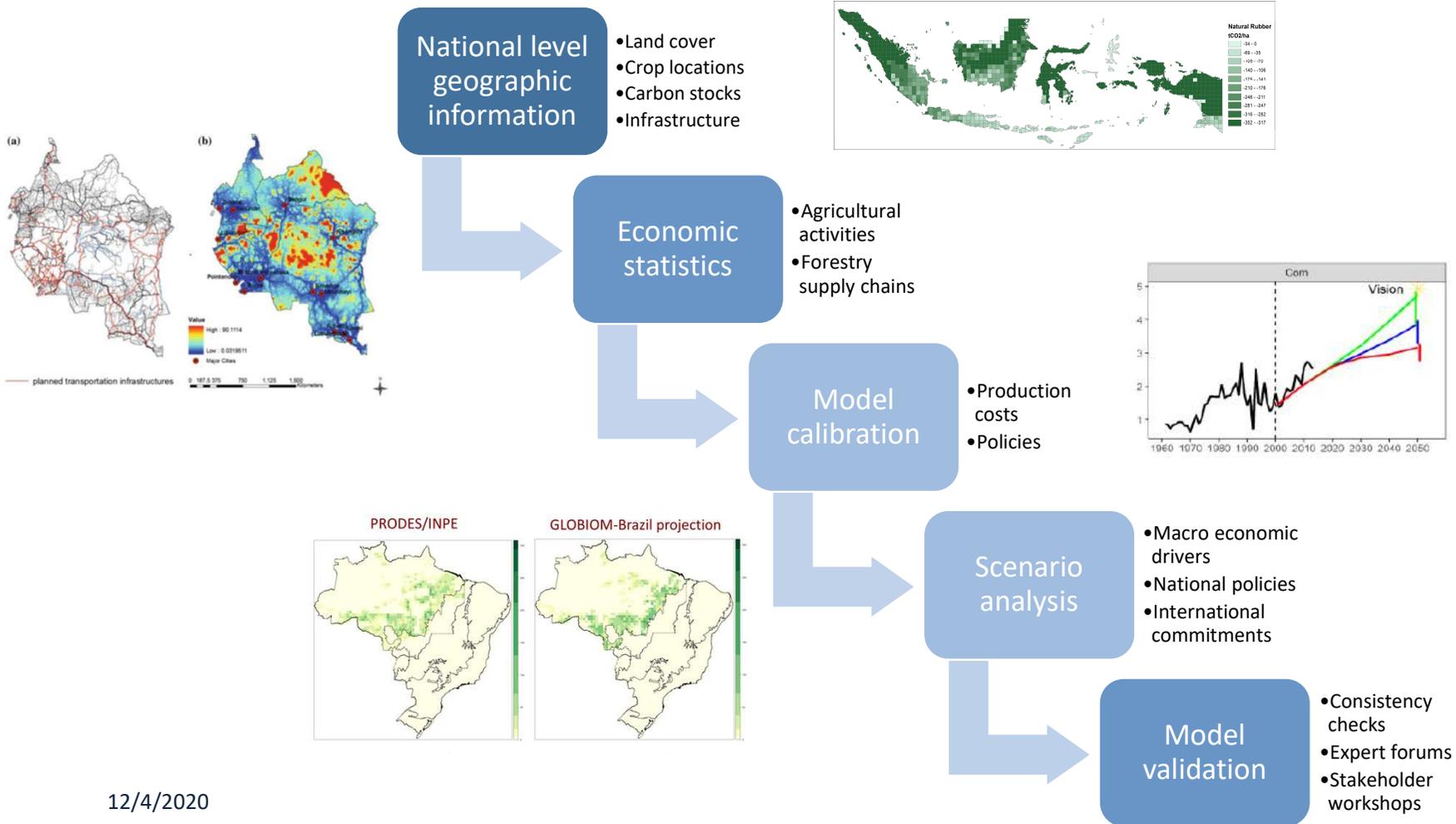
Policy guidance and testing



- Examine feasibility of policies and investments in context of multiple futures and adapt policies to work under uncertain futures
- Downscale scenarios to local level
- Work directly with national stakeholders:
 - Livestock sector in Ghana
 - National Plan for the Rural Sector for Burkina Faso and CGIAR strategy planning

Zougmore, et al. 2016. "Formulation of a Robust National Rural Sector Program in Burkina Faso: What new themes have emerged from the socio-economic and climate scenarios process?." [CGIAR CCAFS Info Note](#).

How can we adapt GLOBIOM to improve the local context?



GLOBIOM- EU

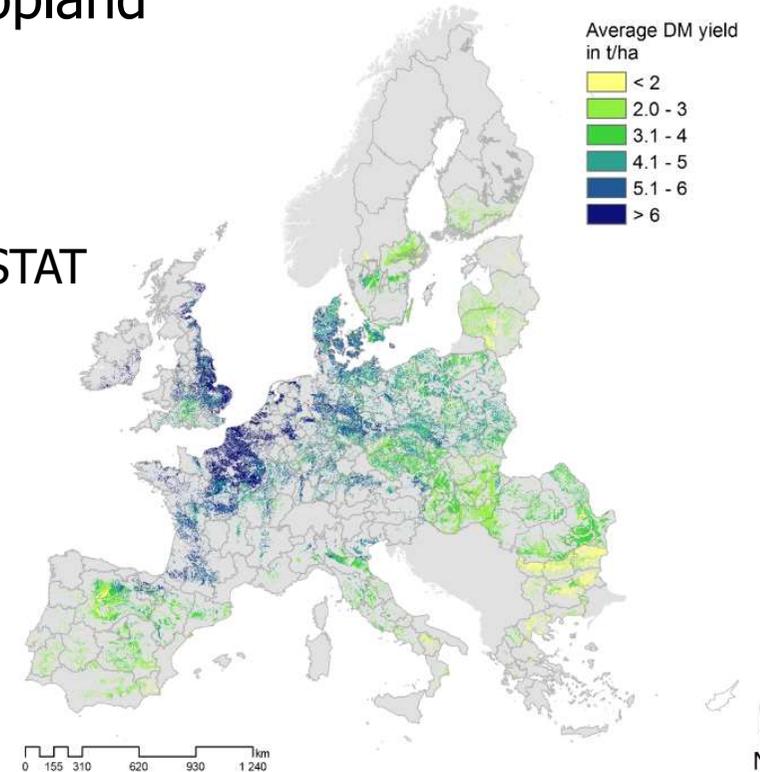
Objective: examine the mitigation potentials of EU cropland

Improvements to the EU Database

- Land cover: CORINE
- Consumption/Production statistics: EUROSTAT to replace FAOSTAT
- Crop yields: from EPIC, expansion of additional crops

Improvements to the Model Representation

- Spatial resolution: replaced by NUTS2
- Processing activities of biofuels
- Representing individual EU countries and Common EU market
- Crop rotations and management practices, soil organic carbon



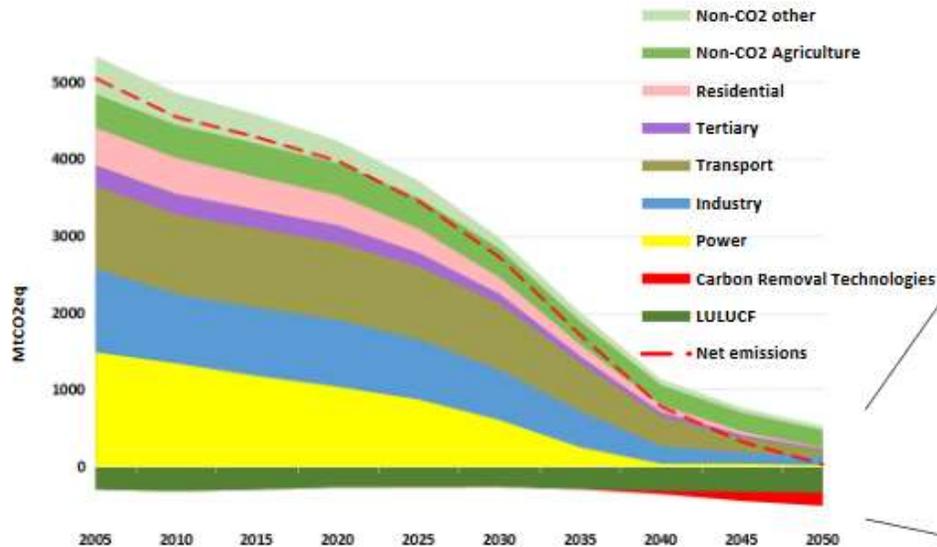
Frank et al. 2015 "The dynamic soil organic carbon mitigation potential of European cropland." Global Environmental Change.

<https://doi.org/10.1016/j.gloenvcha.2015.08.004>

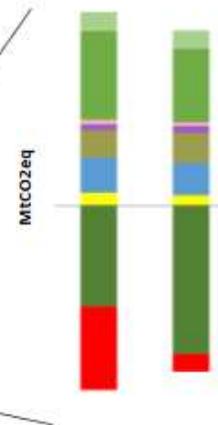
Supporting EU policy makers

LULUCF impact assessments

- EU Reference scenarios 2013, 2016, 2020
- 2020 and 2030 climate and energy framework
- 2050 Long Term Strategy – A Clean Planet for all
- The 2030 Climate Target Plan



Different zero GHG pathways lead to different levels of remaining emissions and absorption of GHG emissions



Biofuels

- The land use change impact of biofuels consumed in the EU

Emissions intensity range per fuel

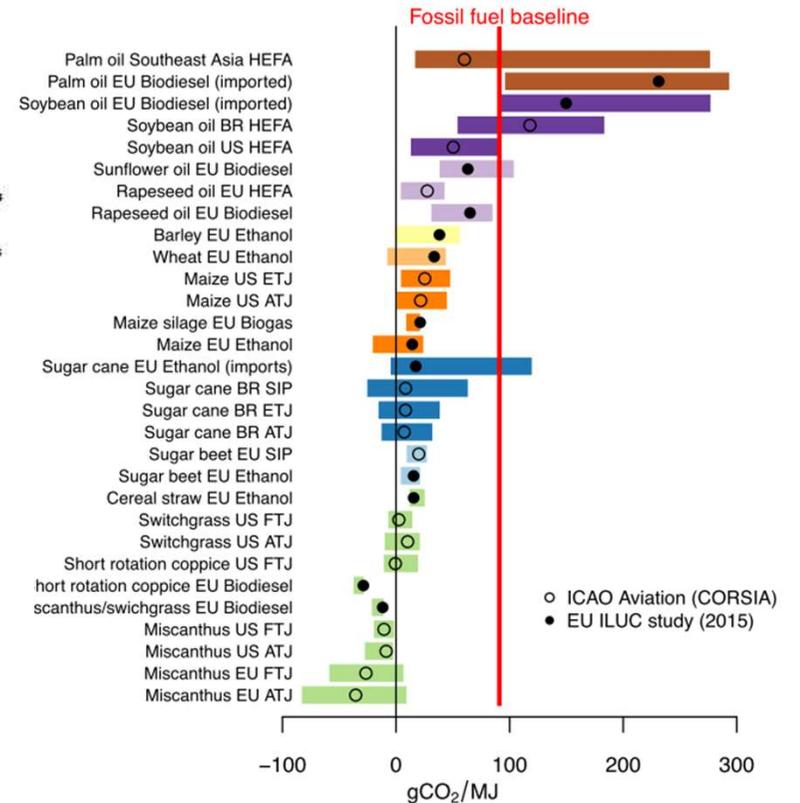


Figure 6. GHG emissions trajectory in a 1.5 °C scenario⁸

GLOBIOM-Brazil

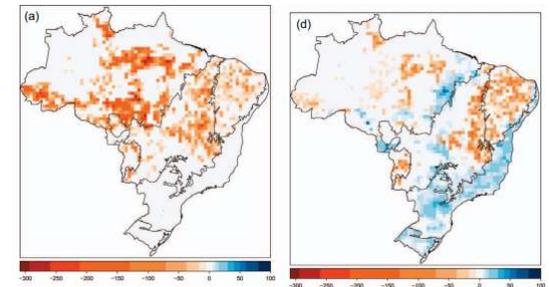
Objective: examine the drivers and policies aimed to curb to deforestation using a model fully developed by Brazilian partners

Improvements to the Brazil Database

- Land cover:
 - Updated for base year 2000 and 2010
 - Forest regrowth as a new class
 - Update Legal Reserve (LR) areas protected by Forest Code and indigenous reserves
- Consumption/Production statistics: updated based on national statistics
- Land conversion costs and pasture productivities

Improvements to the model representation

- Spatial resolution: 0.5 degree grid
- Time horizon shifted from 10 yrs to 5yrs
- Double cropping (soy-maize)
- Validate expansion of cattle using census statistics (IBGE)
- Incorporate Environmental Reserve Quota



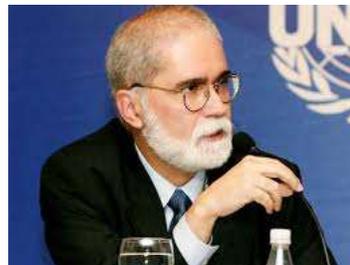
- Zilli et al. 2020, Soterroni et al. 2019. "The impact of climate change on Brazil's agriculture." Science of the Total Environment. [10.1016/j.scitotenv.2020.139384](https://doi.org/10.1016/j.scitotenv.2020.139384).
- de Andrade Junior et al. 2019. Exploring future scenarios of ethanol demand in Brazil and their land-use implications. Energy Policy. [10.1016/j.enpol.2019.110958](https://doi.org/10.1016/j.enpol.2019.110958).
- Soterroni et al. 2019. "Expanding the Soy Moratorium to Brazil's Cerrado." Science Advances. [10.1126/sciadv.aav7336](https://doi.org/10.1126/sciadv.aav7336).
- Soterroni et al. 2018. "Future environmental and agricultural impacts of Brazil's Forest Code." Env. Res. Lett. [10.1088/1748-9326/aaccbb](https://doi.org/10.1088/1748-9326/aaccbb).

GLOBIOM-Brazil model and the Brazil's INDC

"The Brazilian Government has benefited from the cooperation between IIASA and leading Brazilian public institutions INPE and IPEA. The results of the GLOBIOM-Brazil model were quite informative and have provided science-based evidence that has contributed to Brazil's INDC."

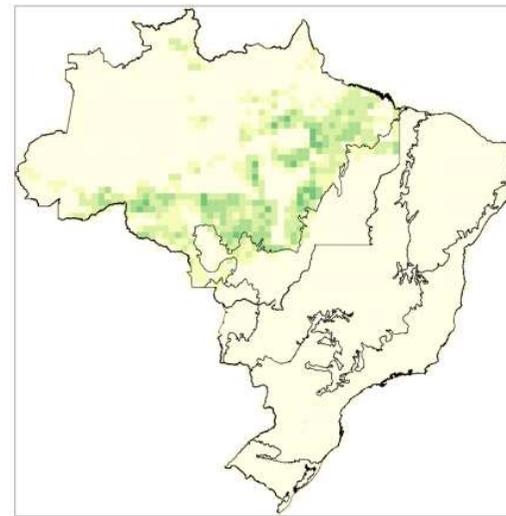
Dr. José Domingos Miguez

Dr. José Domingos Miguez is the Director of the Department of Environmental Evaluation in the Ministry of the Environment, Brazil, and one of the Brazil's leading climate negotiators.

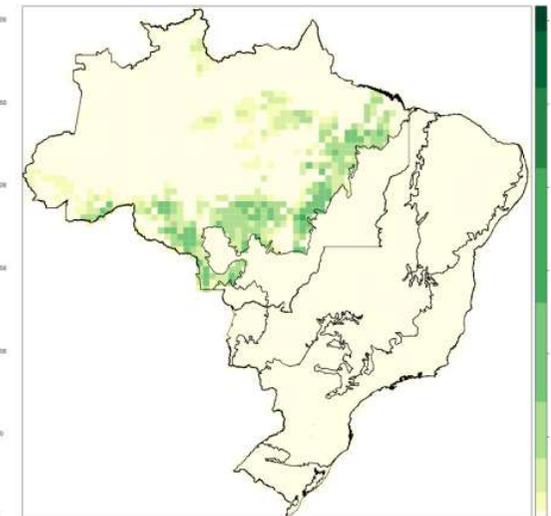


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PRODES/INPE



GLOBIOM-Brazil projection



Cumulated deforestation 2000-2010

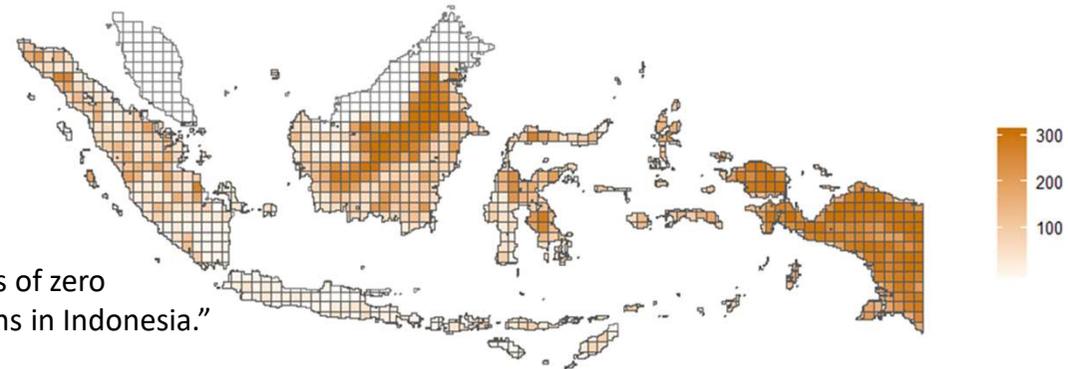
Objective: Assess forest restoration and oil palm expansion at a high special resolution for policy makers

Improvements to the Indonesia database

- Land cover:
 - Updated for base year 2000 and 2010 and added oil palm and rubber plantation
 - Land cover: forest concessions and protected areas
- Consumption/Production statistics: Agriculture statistics at district level
- Inclusion of peatlands

Improvements in Model Representation

- Spatial resolution: 0.5 degree grid
- Time horizon shifted from 10 yrs to 5yrs
- Expanded product coverage to include tree crops: coffee, cocoa, candle nut, cashew, rubber, coconut
- Interaction with system dynamics model



- Mosnier et al. 2017. "Palm oil and likely futures: Assessing the potential impacts of zero deforestation commitments and a moratorium on large-scale oil palm plantations in Indonesia." CIFOR Infobrief. 10.17528/cifor/006468

- Low Carbon Development: A Paradigm Shift Towards a Green Economy in Indonesia. (2019). Ministry of planning (BAPPENAS).

<https://www.greengrowthknowledge.org/national-documents/low-carbon-development-report-paradigm-shift-towards-green-economy-indonesia>.

Supporting green growth policy in Indonesia



1 Identify degradation with innovative measures combining remote sensing and crowdsourcing



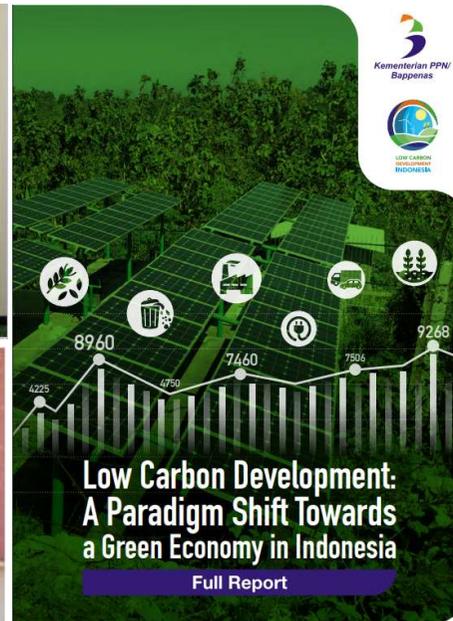
2 Assess biodiversity and climate change implication of varying definitions of degradation



3 Assess restoration options from a Food-Land-Energy nexus perspective

Analyze feasibility of low carbon pathways in the land use sector in terms of biophysical productivity and land use economy

Work closely together with Indonesia's ministry of planning (BAPPENAS) to help inform the country's National Medium-Term Development Plan (RPJMN)



<https://www.greengrowthknowledge.org/national-documents/low-carbon-development-report-paradigm-shift-towards-green-economy-indonesia>

GLOBIOM- Zambezi



Objective: Assess stakeholder pathways for development evaluated across WEL indicators

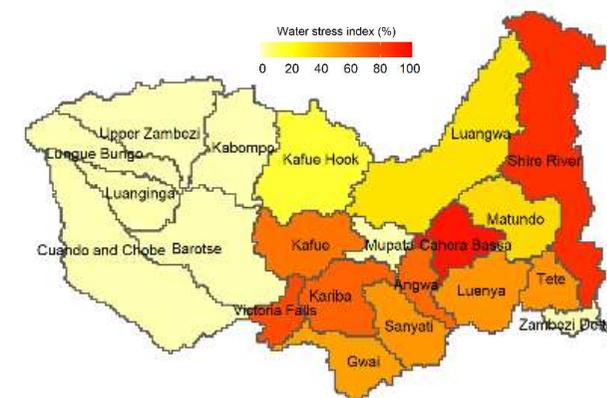
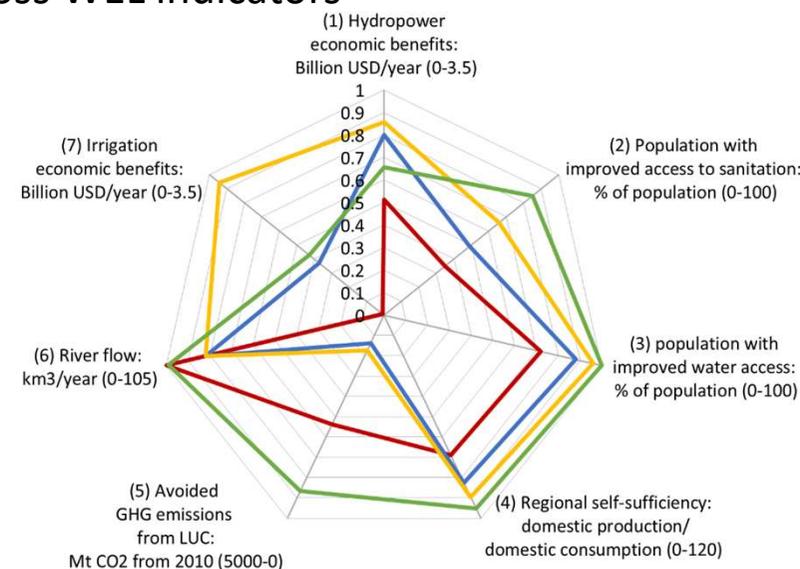
Improve Zambezi database

- Land cover: Updated for base year 2000 and 2010 using RALS HH/LSMS survey
- Consumption/Production statistics: Trends based on Nat. Statistics and FAOSTAT
- Spatial resolution: River basin network overlaid on existing grid structure to upstream-downstream connection

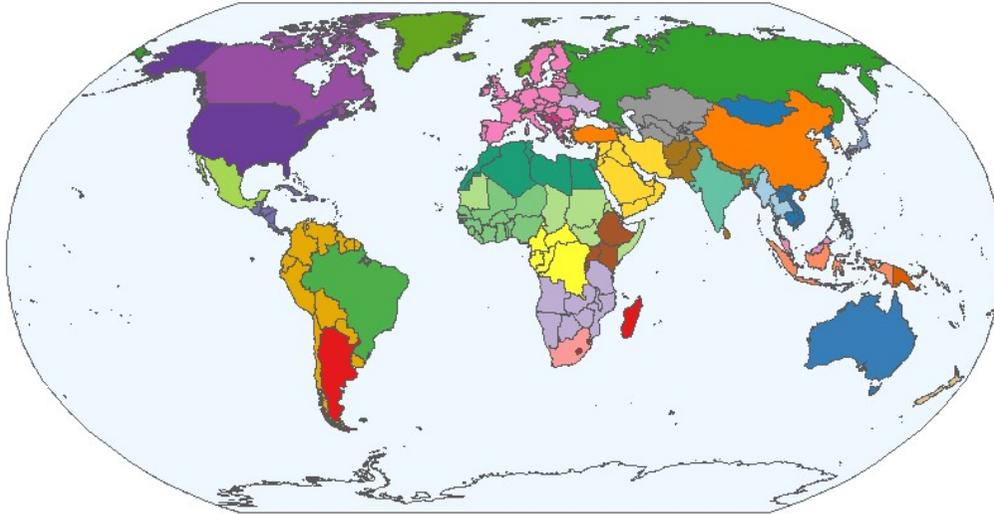
Improve Model Representation

- Ag policies (subsidies for inputs, grain storage requirements) incorporated
- Trade between Zambezi countries adjusted to reflect regional data
- Integrate model linkages between 5 IIASA models along the land-water-energy nexus

Palazzo et al. (Under consideration). Assessing regional development goals through a water-energy-land lens in the Zambezi river basin.



Other regional work



- Andes
- Argentina
- Colombia
- Congo Basin
- China
- East Africa
- Ethiopia
- Indonesia
- Mexico
- South Asia
- South East Asia
- Russia
- Ukraine
- USA

- Mason-D’Croz et al. 2016. “Multi-factor, multi-state, multi-model scenarios: Exploring food and climate futures for Southeast Asia.” *Environmental Modelling & Software*. <http://dx.doi.org/10.1016/j.envsoft.2016.05.008>
- Vervoort et al. 2014 “Challenges to scenario-guided adaptive action on food security under climate change.” *Global Environmental Change*. <http://dx.doi.org/10.1016/j.gloenvcha.2014.03.001>
- Mosnier et al. 2012. Modeling Impact of Development Trajectories and a Global Agreement on Reducing Emissions from Deforestation on Congo Basin Forests by 2030. *Env. Res. Econ.* 10.1007/s10640-012-9618-7
- Boere et al. 2018. Developing Country-Wide Farming System Typologies: An Analysis of Ethiopian Smallholders’ Income and Food Security. *IFAD Research Series No. 32*
- FABLE 2019. Pathways to Sustainable Land-Use and Food Systems. 2019 Report of the FABLE Consortium. <https://bit.ly/3mpg9yB>
- Hao Zhao, Petr Havlík, Jinfeng Chang, et al. (in review). The environmental sustainability challenge of future food demand in China and its major trading partners.

For further information: www.globiom.org

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