

Carbon footprint from Brazilian soybeans based on spatially-explicit life cycle inventories, including land use change

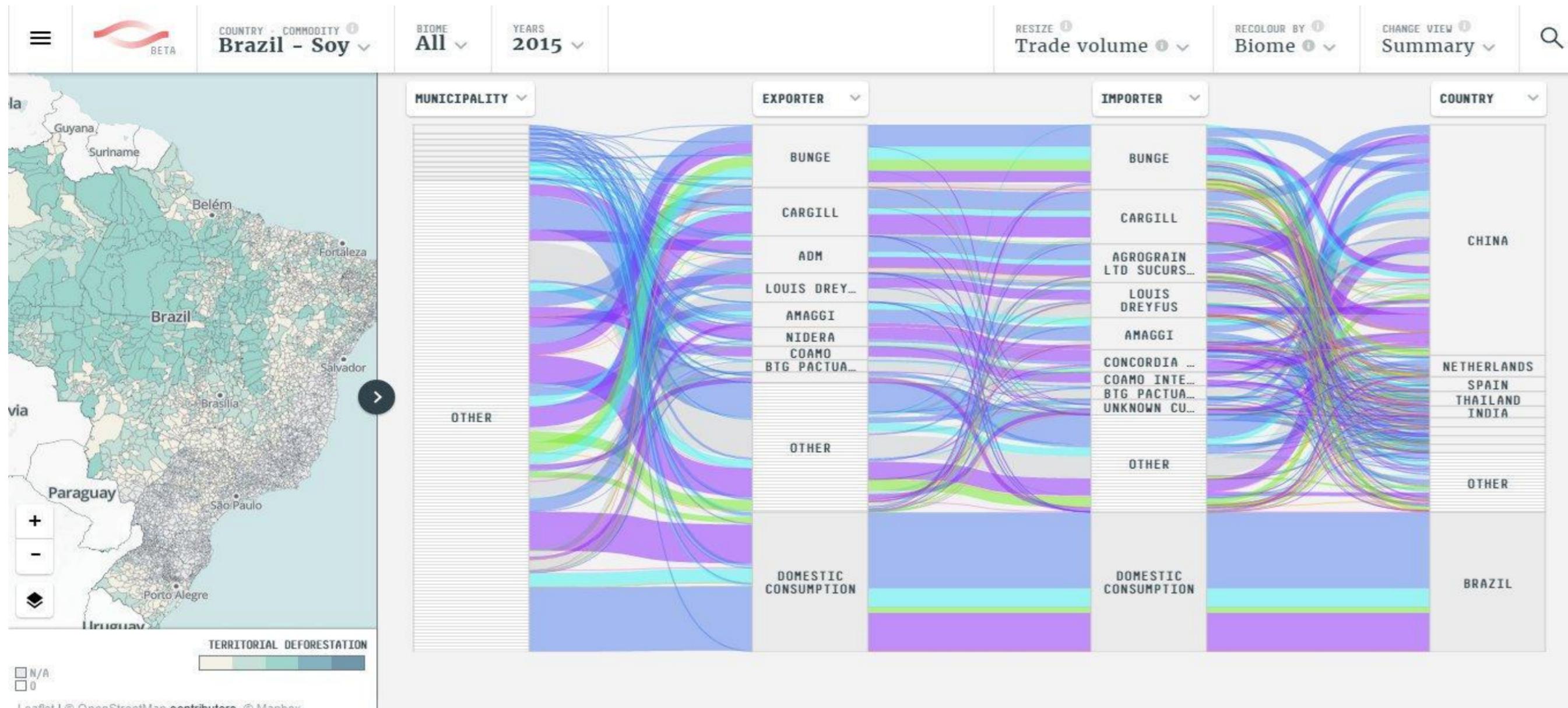
Neus Escobar¹, E. Jorge Tizado², Javier Godar³

¹Institute for Food and Resource Economics (ILR), University of Bonn, Nussalle 19, 53115 Bonn (Germany)

²Department of Biodiversity and Environmental Management, University of León, 24400 Ponferrada (Spain)

³Stockholm Environmental Institute (SEI), Linnégatan 87D, 115 23 Stockholm (Sweden)

Global soybean supply chains



- Brazilian soybean is the most traded agricultural commodity in the world
- One of the main drivers of deforestation in the Amazon and Cerrado: **land use change**
- Role of Brazilian soybean to mitigate carbon emissions globally
- TRASE as a tool for supply chain transparency: <https://trase.earth>

Life Cycle Assessment module: TRASE-LCA

- Goal and scope: carbon footprint of all the supply chains embodied in the entire Brazilian soybean production for a given year in 2010-2015 (t CO₂-eq. per t soybean)
- LCIA: IPCC Tier 2 (2006) and ReCiPe2016 (Huijbregts et al. 2016)

| Sub-stage | Soybean flow data | Inventory data |
|-------------------------|--|--|
| Land Use Change | Spatially-explicit deforestation and soybean expansion | Land carbon stocks per biome at the municipality level, plus biomass burning |
| Agricultural production | Sub-national soybean production | Lime and fertilizer consumption in double and single cropping at the State level |
| Domestic transport | Sub-national transport distance matrix | Transport mix (road, river, freight) to port of export |
| Transoceanic transport | Per shipment customs of international trade | Per vessel CO ₂ -eq. emissions to port of import |
| Crushing | Soybean processing ratio in the importing countries | CO ₂ -eq. for oil and cake in Brazil vs. Rest of the World |

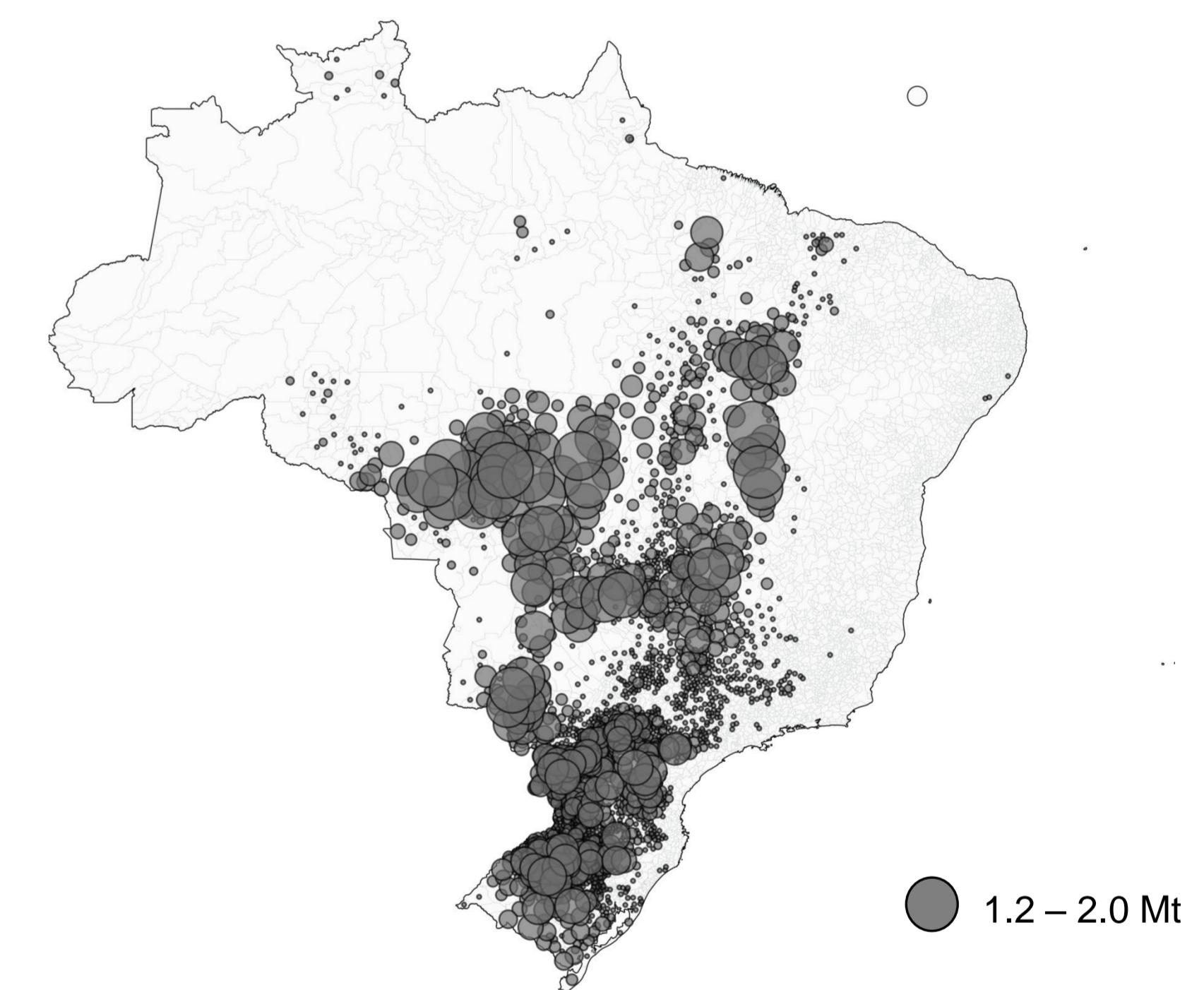


Figure 1. Tonnes of soybean exported from each municipality in 2015

Results

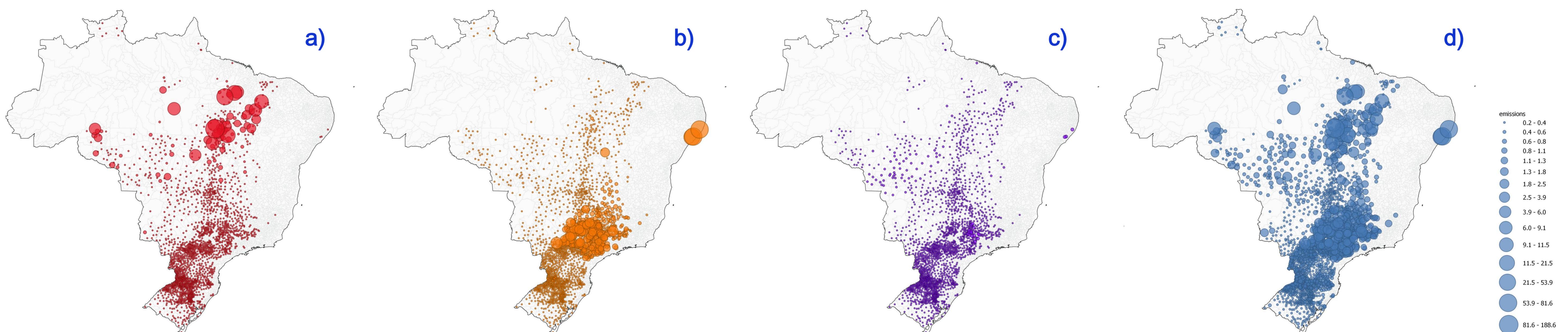


Figure 2. Tonnes of CO₂-eq. per tonne of soybean produced in 2015 in each municipality from a) Land Use Change; b) soybean farming, c) domestic transport, d) total life cycle emissions

Conclusions

- TRASE-LCA: convergence **between top-down Physical Flow Accounting and bottom-up LCA**
- Carbon footprint of all the real-world life cycles of Brazilian soybean is annually quantified a) at the supply chain level, b) at the municipality level, c) per trading company, d) per country of import
- **Tool for global responsibility**, supply chain governance, and deforestation and climate policies