



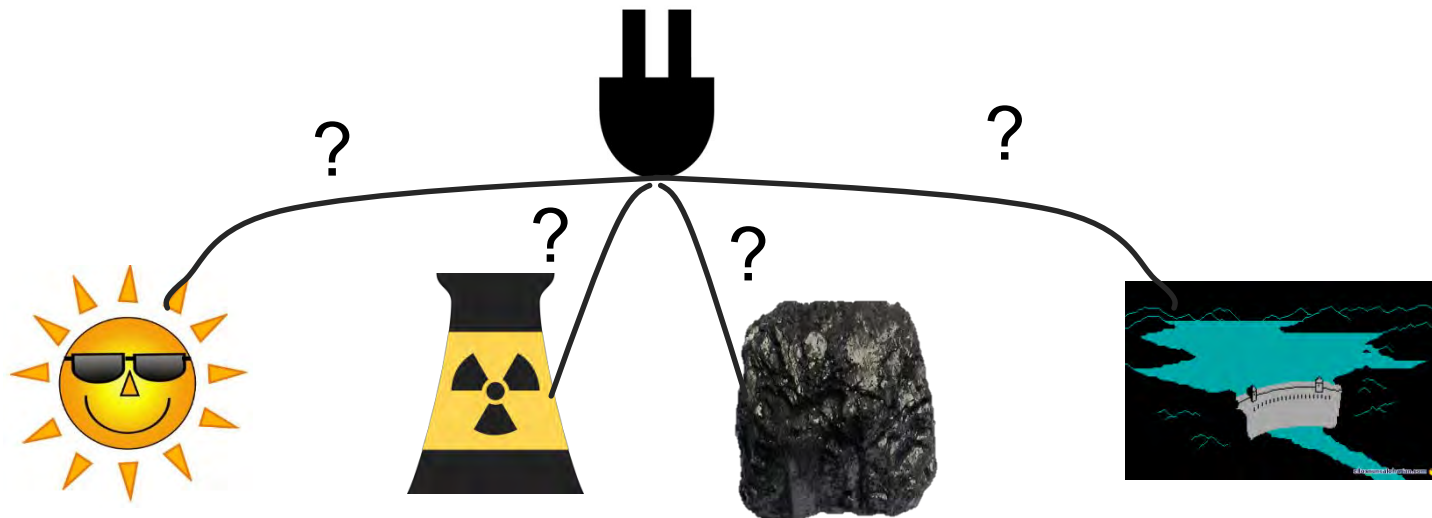
Regionalizing inventories by combining unit process and MRIO information for enhanced LCI and LCIA

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LCA DF 69 on Regionalization, Zurich, September 13, 2018

Regional aspects

- For foreground processes available, but...
 - Supply chains often generic



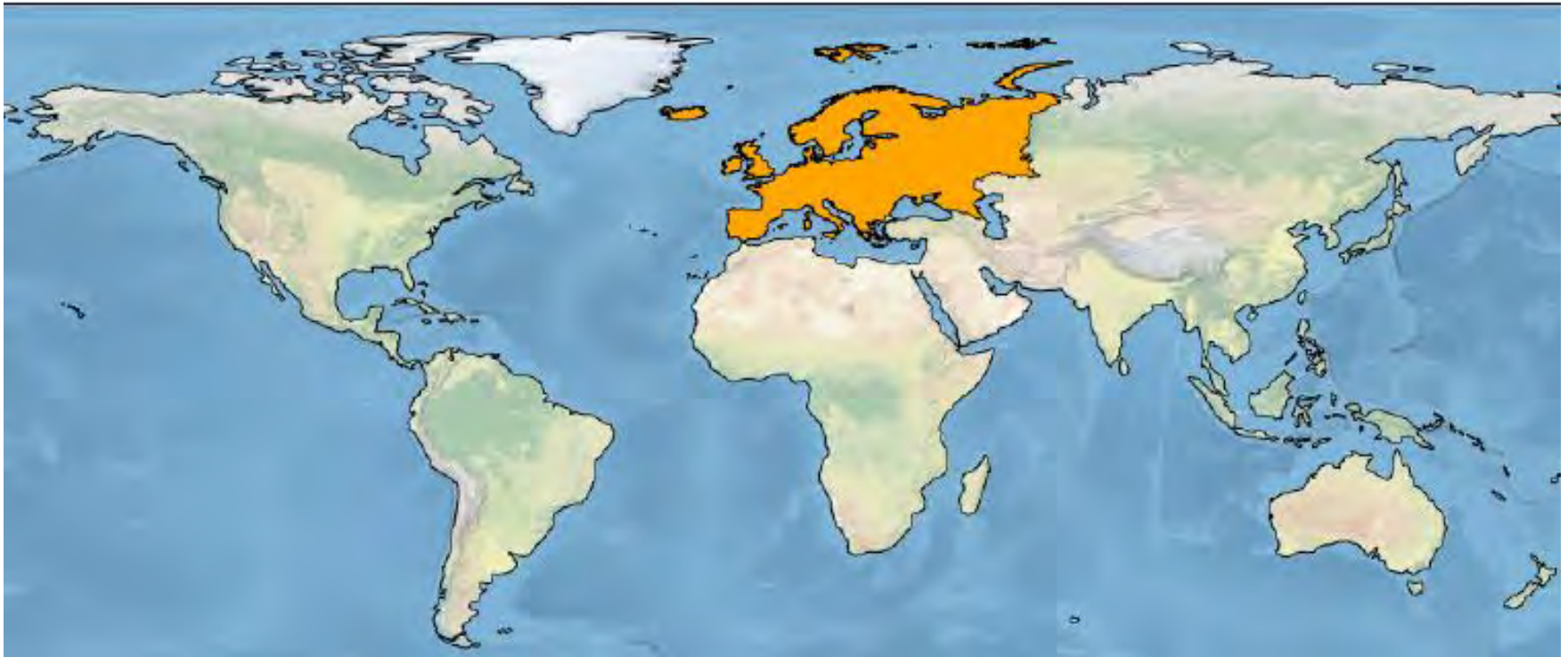
Situation ecoinvent v3.3

electricity sector



Situation ecoinvent v3.3: European datasets

30% of transforming activities



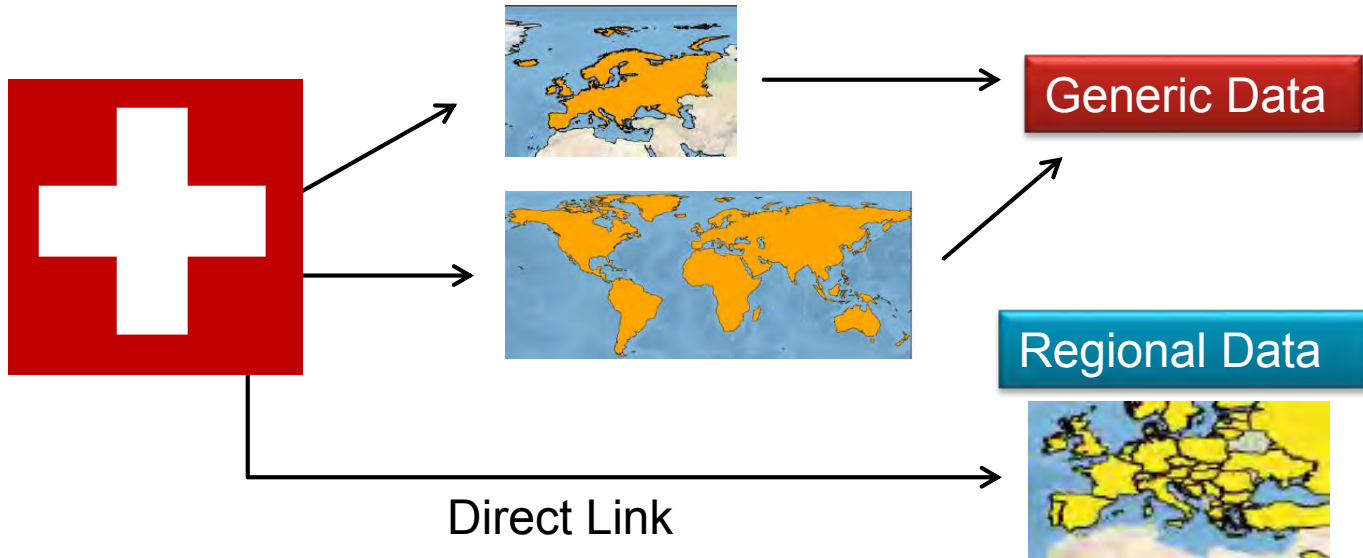
Situation ecoinvent v3.3: Global datasets

20% of transforming activities, 90% of market activities



Situation ecoinvent: Global markets

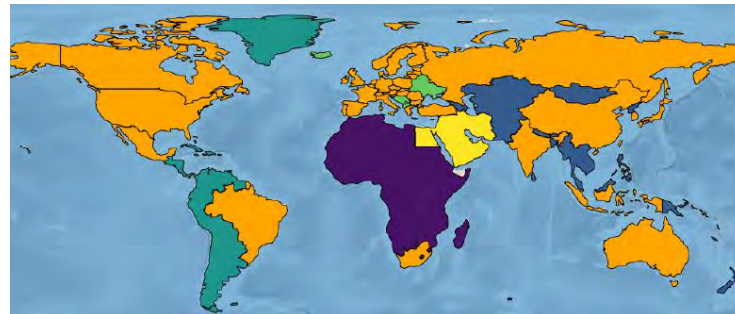
- Markets are mainly global
 - Supply chain often modeled as global



Approach: Combine MRIO and LCI

Ecoinvent and Exiobase

- Ecoinvent 3.3 life cycle inventory database
- Exiobase 2.2 global multi-regional input-output database



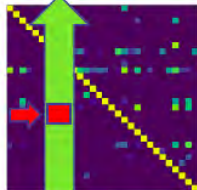
Combining the database

- Combine information:
 1. Create dataset for all 48 Exiobase region (copy of best match)
 2. Replace aggregated markets (RoW, GLO) with Exiobase “market”
 3. Create integrated hybrid matrix
- Rest of the world and global datasets get eliminated
 - At least regional resolution for all markets and processes (exiobase regions like “Rest of Africa”)

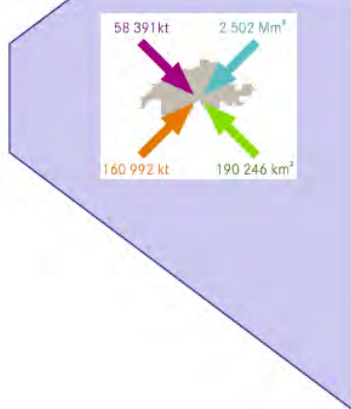
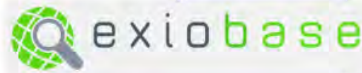
Combining the database



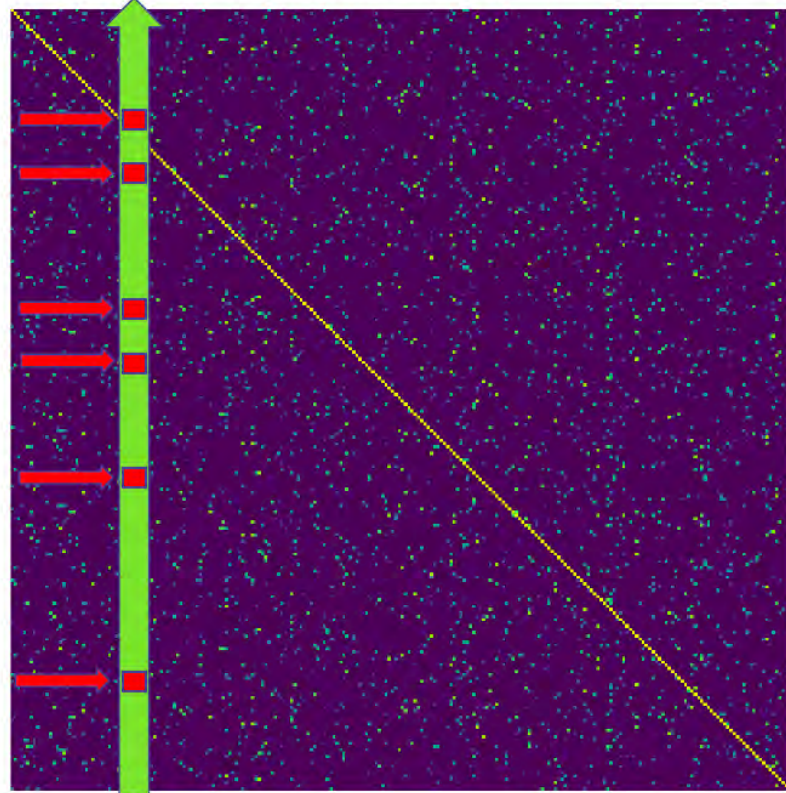
Ecoinvent
technosphere
matrix



12k x 12k
activities



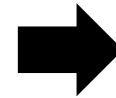
Regionalized technosphere matrix



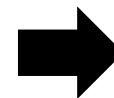
307k x 307k activities

Biogas Example Inventory

- Ecoinvent v3.3
 - Swiss Biogas: Methane 96%, CH
 - Biogas from global market
 - Biogas global:
 - >99% RoW (rest of the world) Biogas
 - <1 % Swiss Biogas
- Hybrid model (with exiobase v2.2)
 - Swiss Biogas
 - 7 % RoW (rest of the world) Biogas
 - 93 % Swiss Biogas

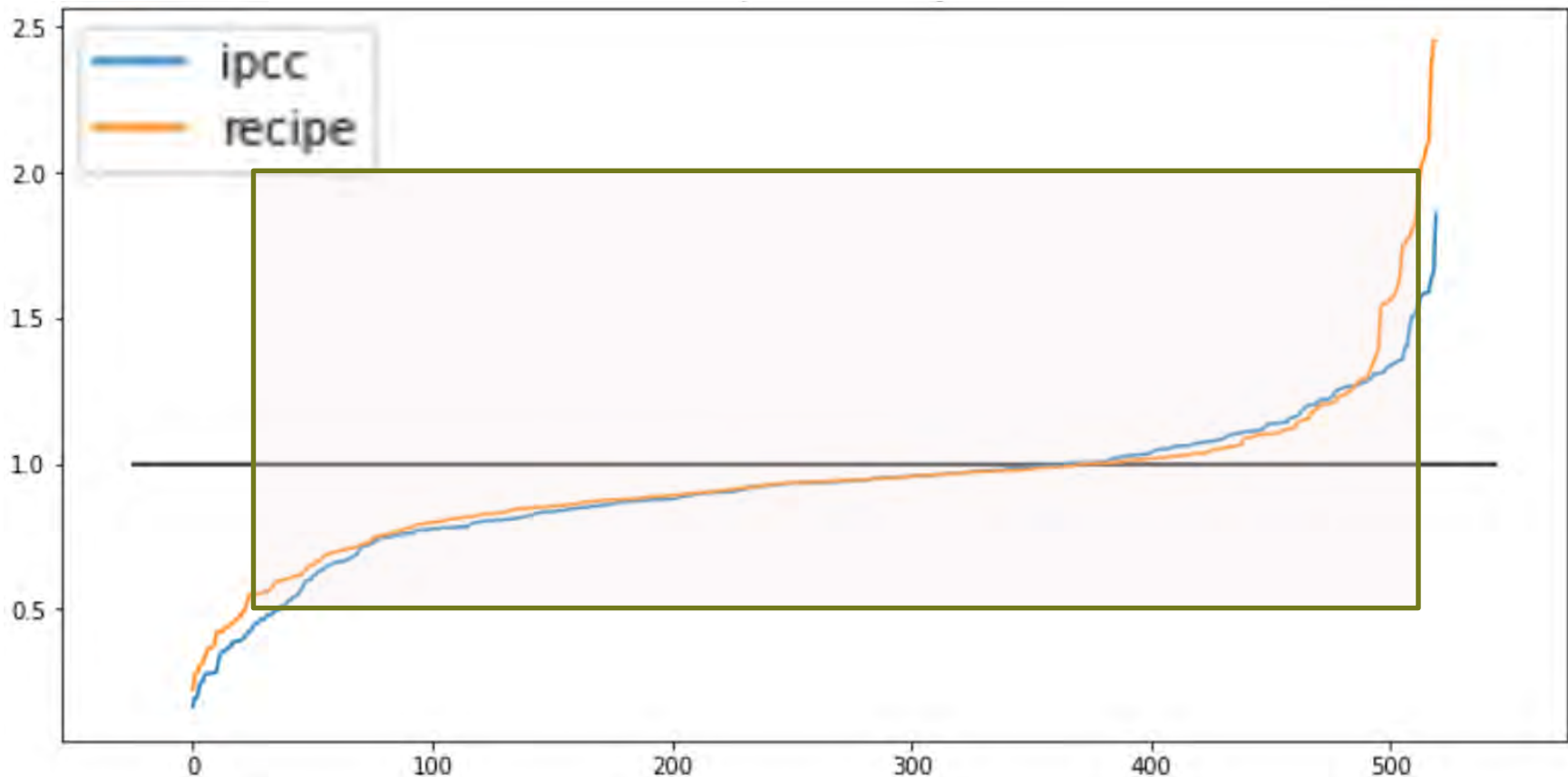


Results ~ identical
to RoW dataset

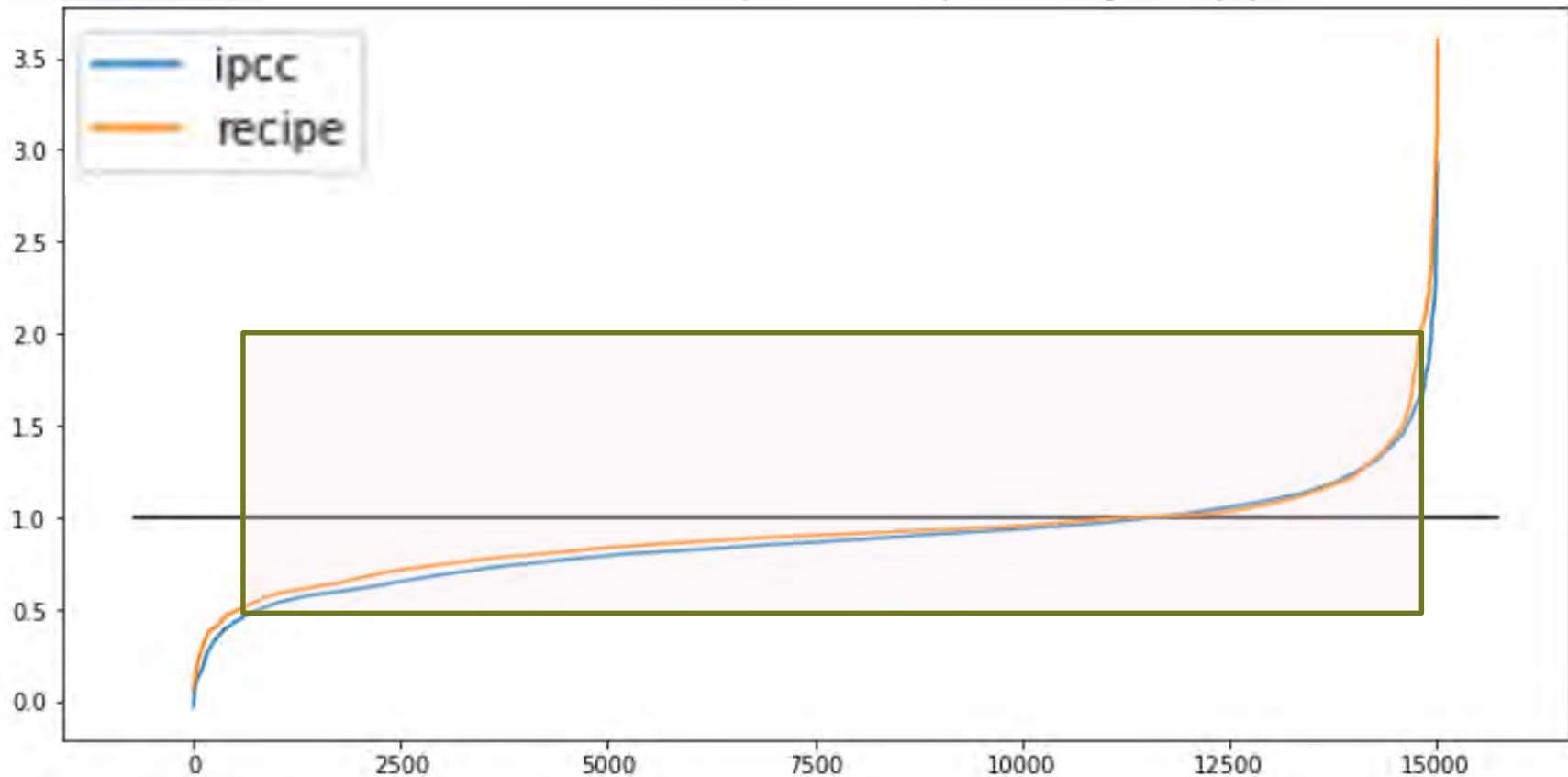


93% specific Swiss
conditions included

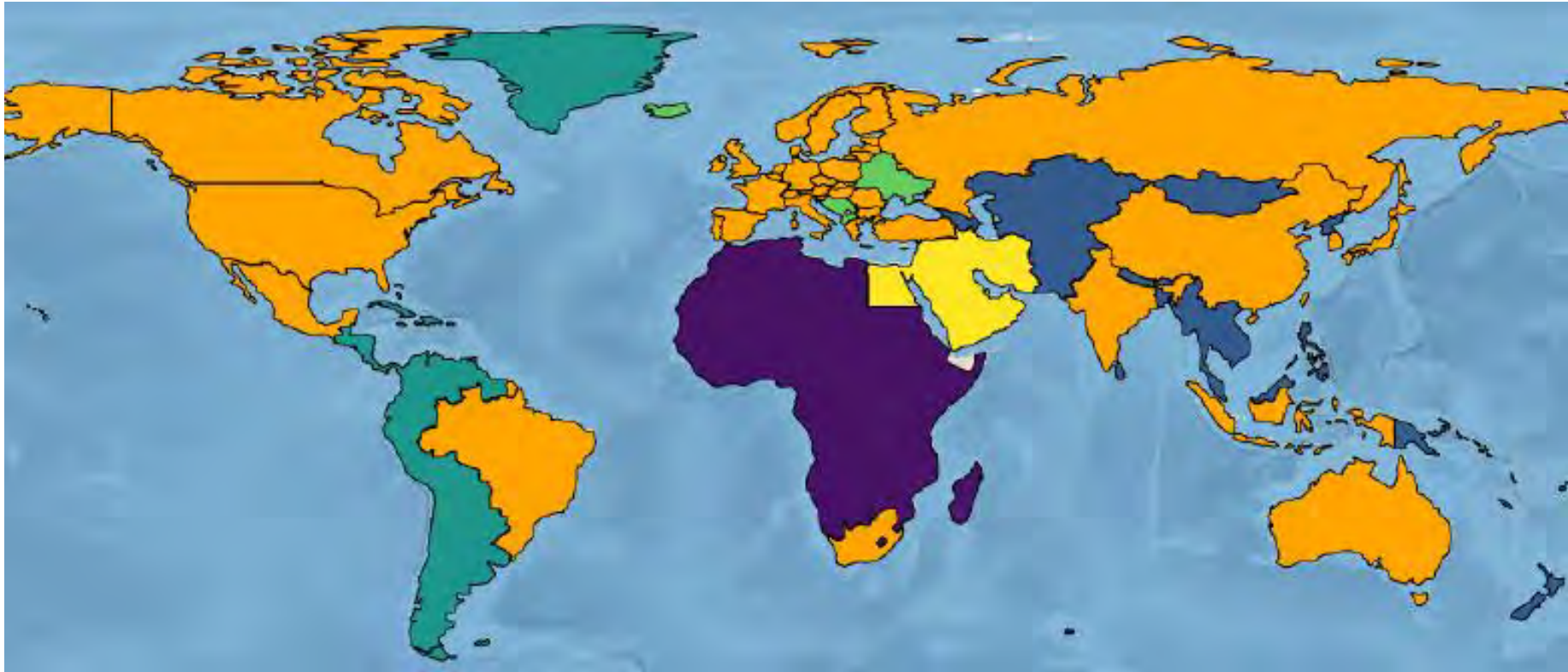
Systematic assessment of transport sector – Ratio: regionalized hybrid / ecoinvent v3.3



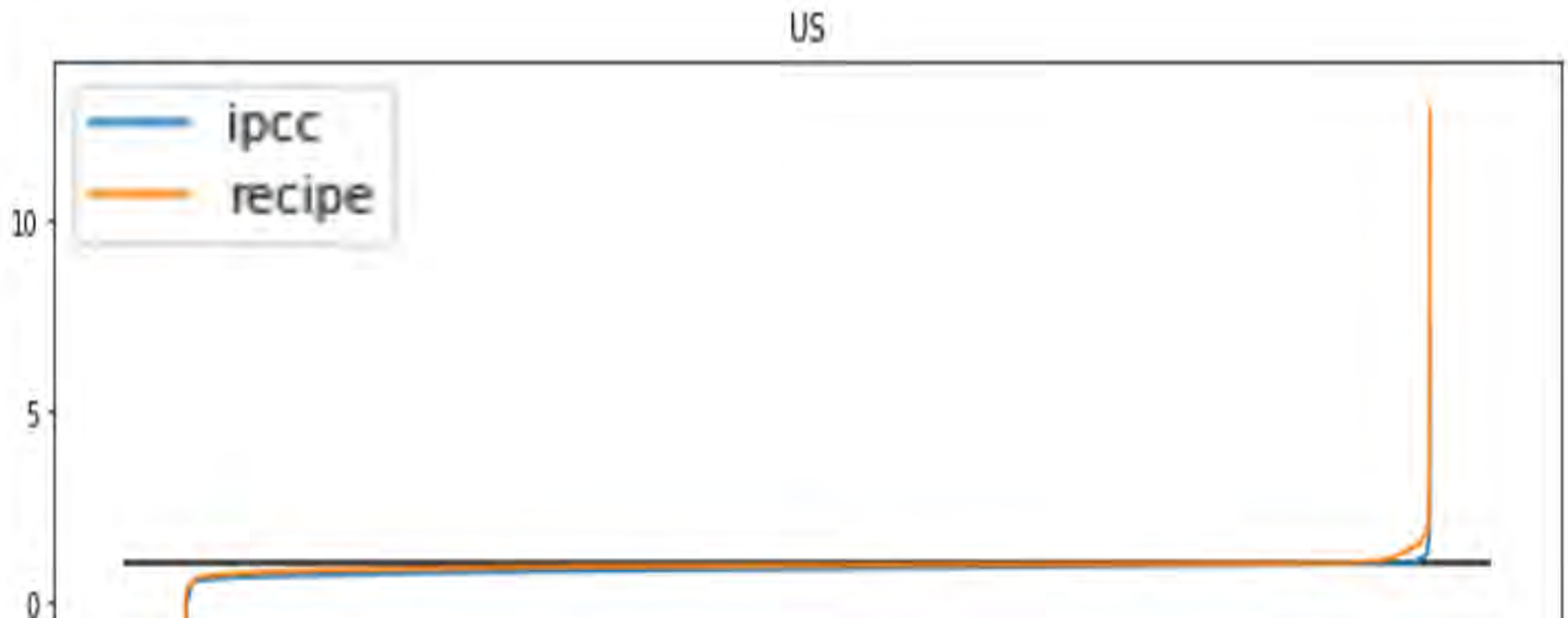
Systematic assessment of metal sector – Ratio: regionalized hybrid / ecoinvent v3.3



Localisation for impact assessment

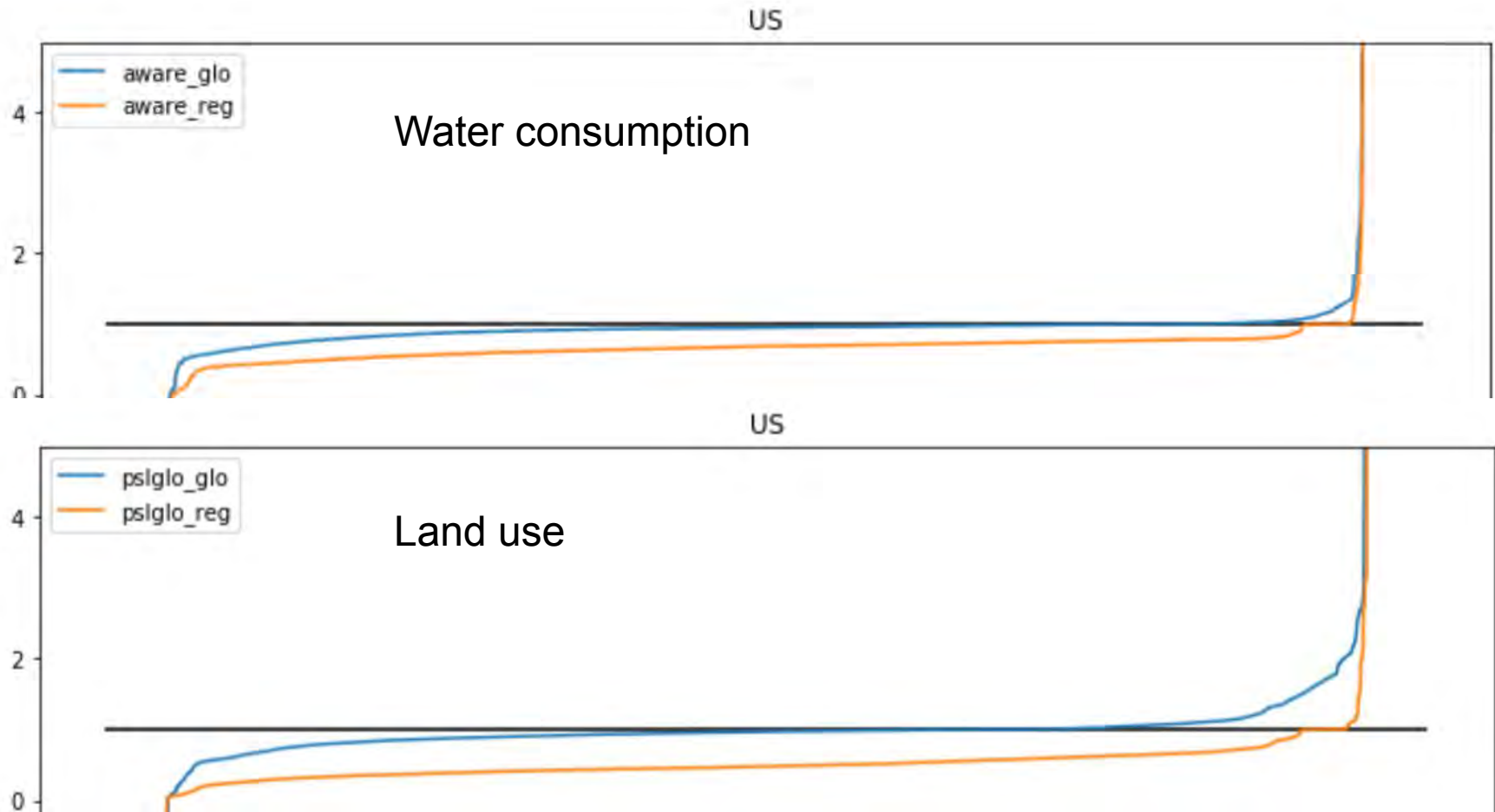


Regional LCI effects (I): The US – Ratio: regionalized hybrid / ecoinvent v3.3



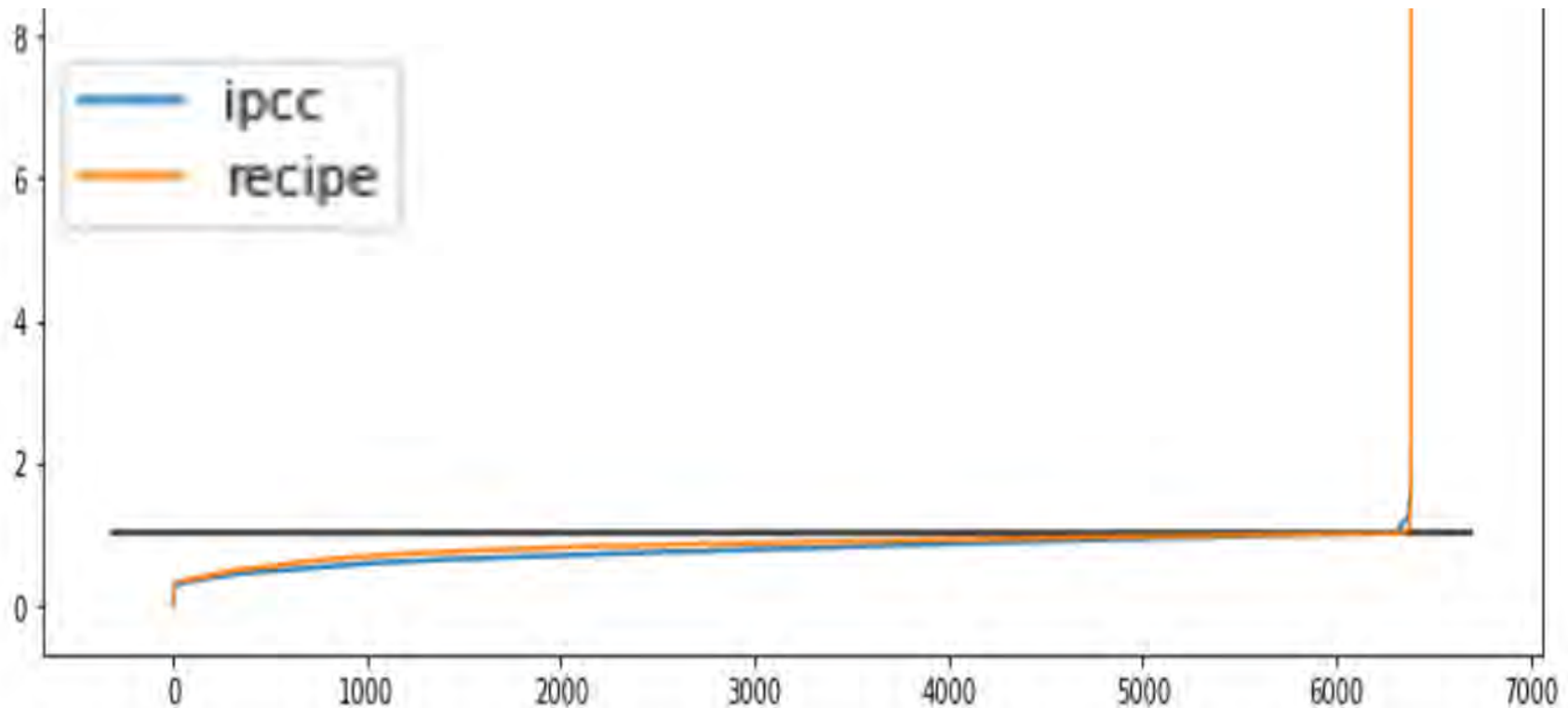
Regional LCIA effects (I): The US

Blue line = inventory variation, Orange = incl. regionanlised CFs



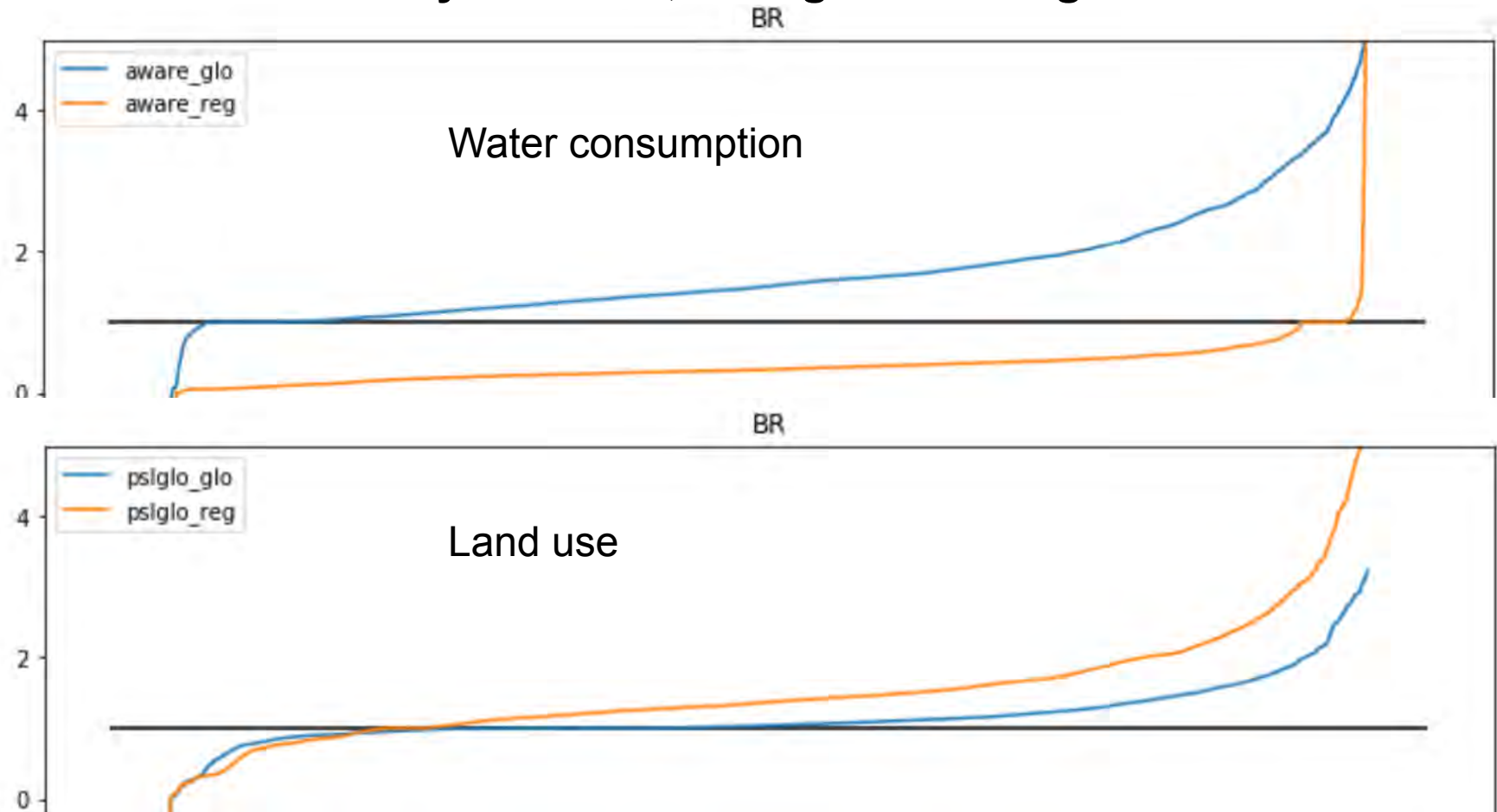
Regional LCI effects (II): Brazil –

Ratio: regionalized hybrid / ecoinvent v3.3

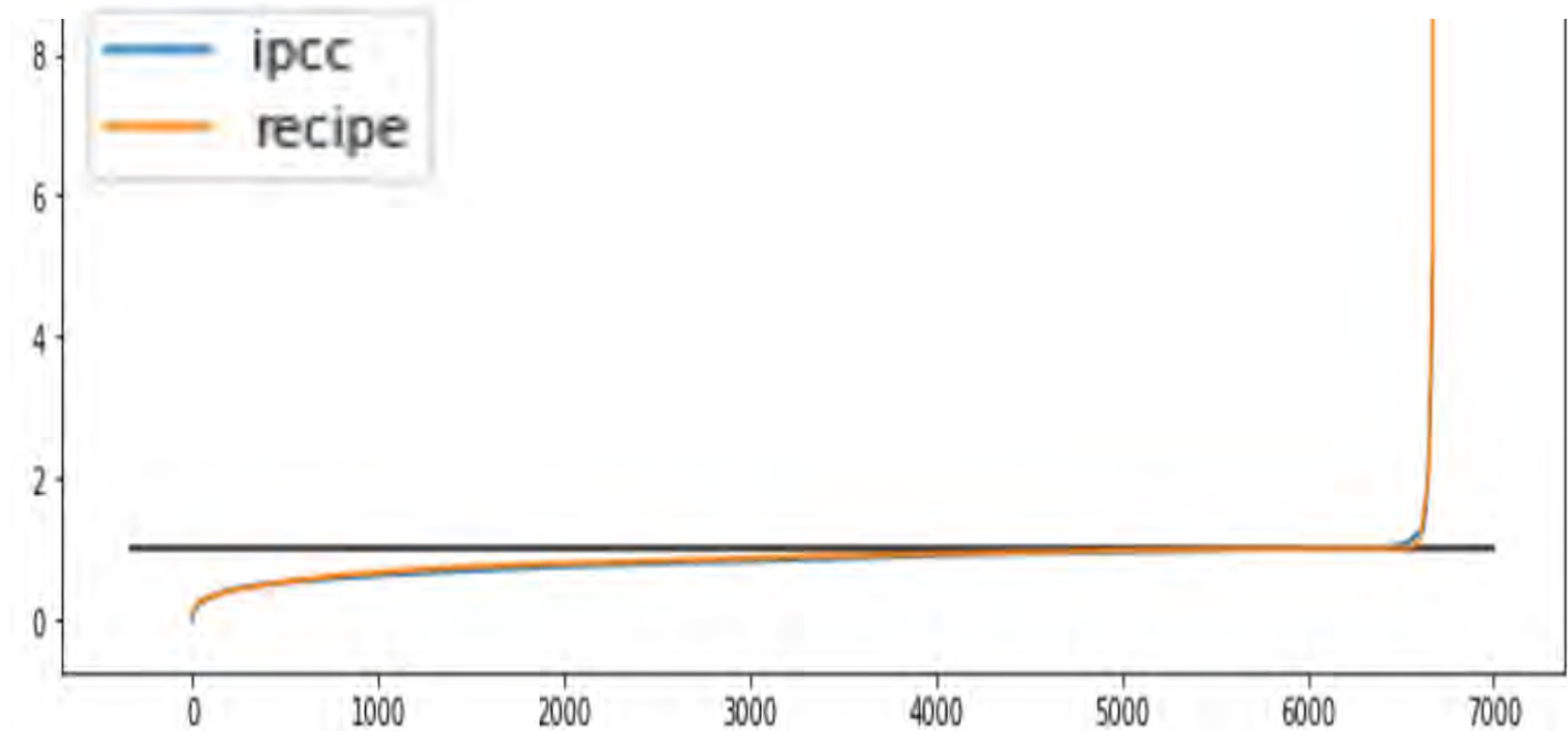


Regional LCIA effects (II): Brazil

Blue line = inventory variation, Orange = incl. regionalised CFs

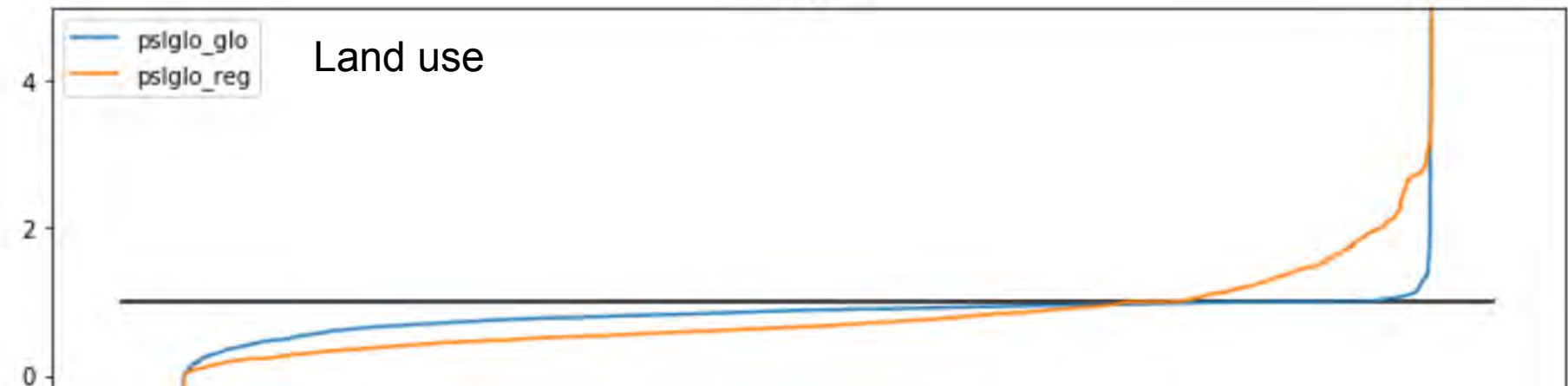
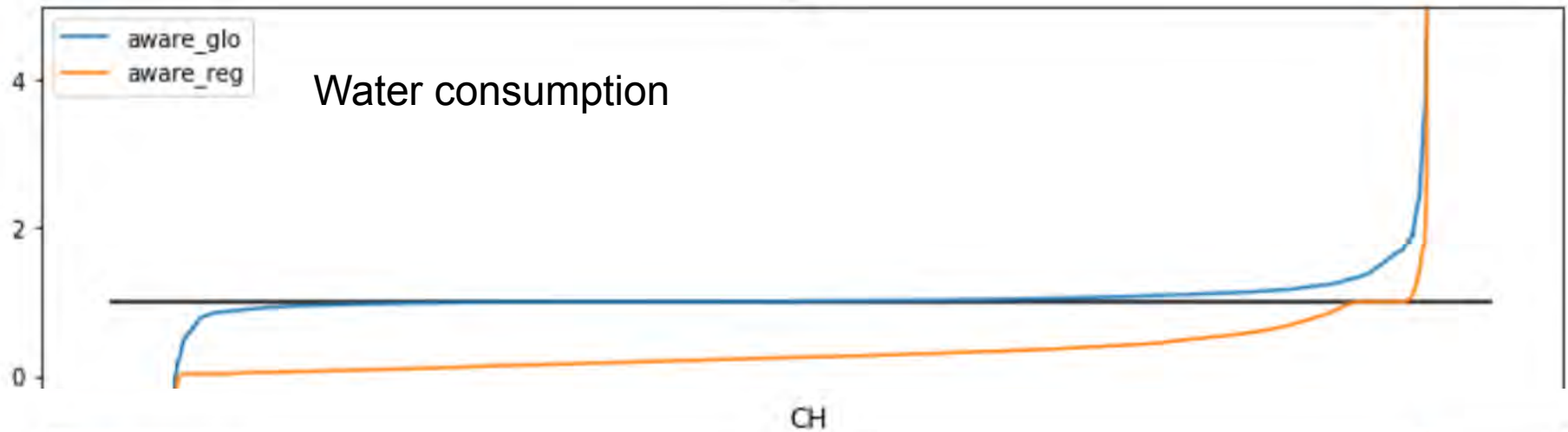


Regional LCI effects (III): Switzerland



Regional LCIA effects (II): Switzerland

Blue line = inventory variation, Orange = incl. regionalised CFs



Conclusions

- Economic data from global multi-regional input-output (GMRIO) increases regional resolution of LCI
 - Utilize available regional detail by disaggregating global markets
 - Apply region-specific marginal technologies throughout supply chain
 - Consistent procedure (no manual fixes)
- Geographically explicit inventory facilitates regionalized impact assessment
- Regionalized CFs could be pre-calculated to scale LCIA results of background data
- Computational problems are not limiting with 50 regions

Thank you for your attention!



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