Environmental Footprints of Switzerland: Developments 1996-2015

Regionalisation for Biodiversity and Water Footprint

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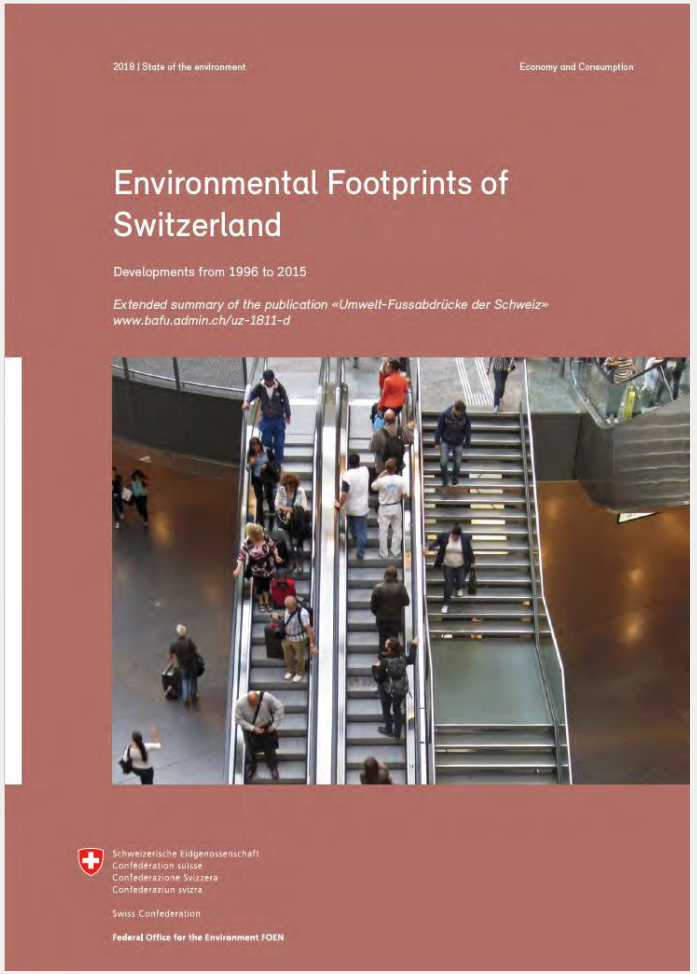

Project Goals

- Time series 1996-2015 of
  - domestic environmental footprints
  - environmental footprints caused by trade (import & export)
  - environmental footprints caused by Swiss final demand
- Careful plausibility check
- Comparison against global planetary boundaries
- Implications of future scenarios on the environmental footprints of Switzerland

Environmental Footprints
Basic Approach

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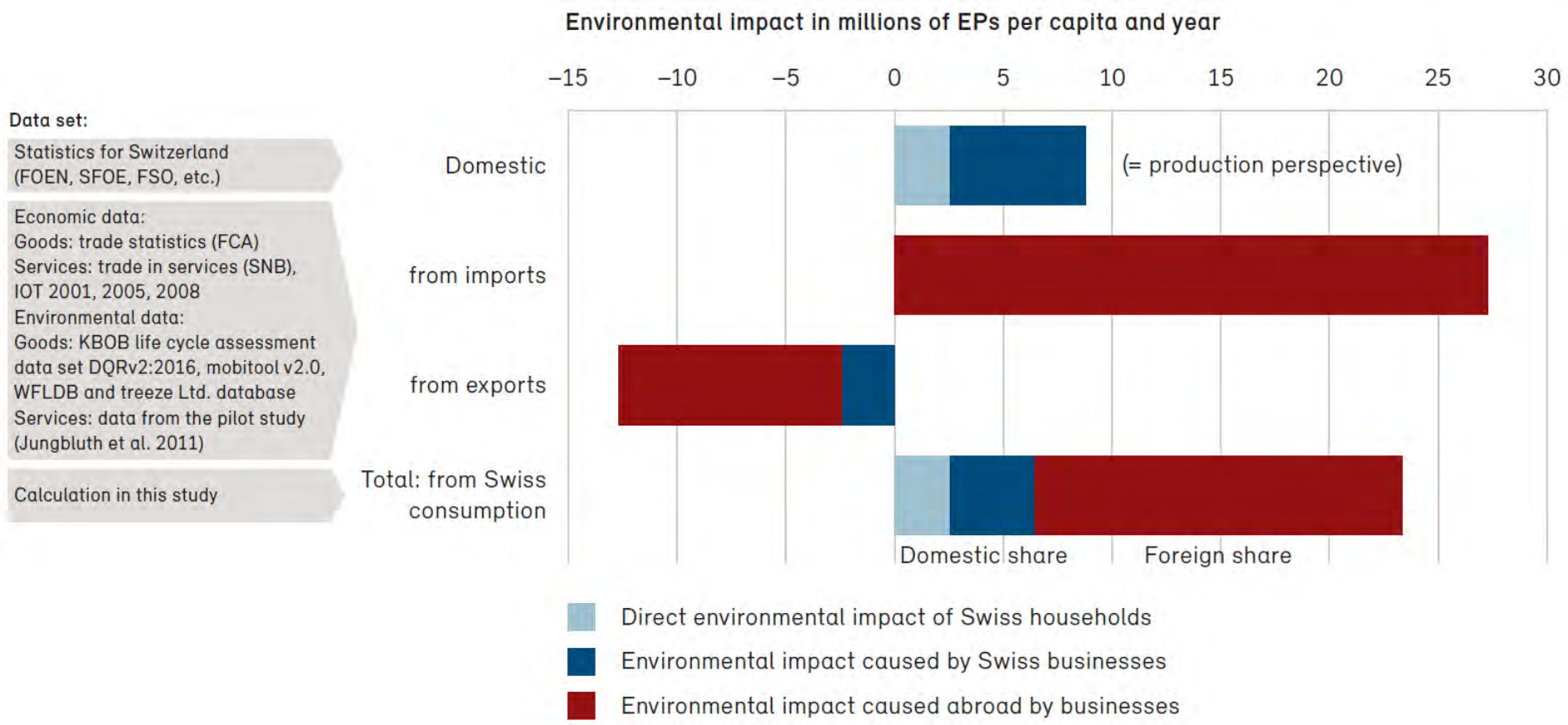
«TRAIL» method (trade information and LCA)



Regionalisation
Main Concept

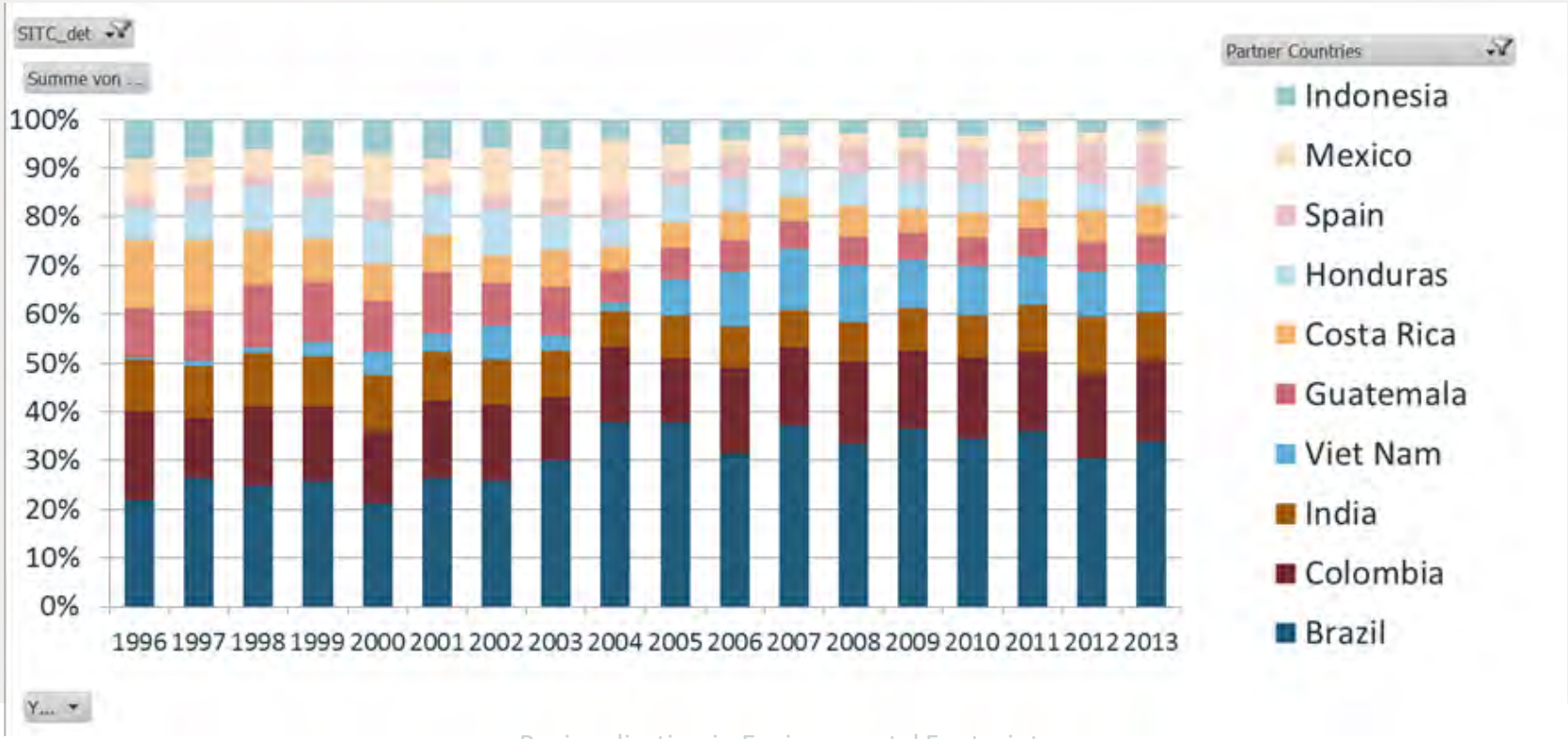
- Large scope (consumption Switzerland, 20 years) and limited budget required simplified approach
- Focus on
  - land use impacts on biodiversity
  - water use impacts on water scarcity
- Maximum resolution impact factors/LCIs: country level
- Introduction of additional elementary flows for land occupation and water use
- Minimum country coverage of regionalised LCIs of imported agricultural goods: 65 %

LCI Regionalisation Agricultural Products

- Country specific data
  - yield (agricultural products)
  - land use (derived from yield)
  - irrigation water demand
  - electricity mix (in case electricity is used)
- No country specific efforts/pesticides application etc.

LCI Regionalisation
Import of Coffee

- Brazil, Colombia, India, Vietnam
- Costa Rica (extrapolated on the basis of Colombia)



Regionalised LCI Dataset Coffee in Colombia

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Produkte						
Outputs zur Technosphäre. Produkte und Koppelprodukte	Menge	Einheit	Menge	Allokation	Abfalltyp	Kategorie
Coffee, green beans (Arabica), at farm (WFLDB 3.1)/CO U	597	kg	Mass	100 %	nicht definier	_WFLDB 3.1...\Coff
(Zeile hier einfügen)						

Outputs zur Technosphäre. Substituierte Produkte	Menge	Einheit	Verteilung	SA^2 oder 2	Min	Max	Kommentar
(Zeile hier einfügen)							

Input							
Bekannte Inputs aus der Natur (Ressourcen)	Sub-Kompartiment	Menge	Einheit	Verteilung	SA^2 oder 2	Min	
Occupation, permanent crop, fruit, CO	land	10027	m2a	Logarithmis	1.113		
Transformation, from permanent crop, fruit	land	500	m2	Logarithmis	1.2077		
Transformation, to permanent crop, fruit	land	500	m2	Logarithmis	1.2077		
Carbon dioxide, in air	in air	750.02	kg	Logarithmis	1.0744		
Energy, gross calorific value, in biomass	biotic	7945.2	MJ	Logarithmis	1.0744		
Water, river, CO	in water	62.954	m3	Logarithmis	1.4049		
Water, well, in ground, CO	in water	3.3133	m3	Logarithmis	1.4049		
Water, unspecified natural origin, CO	in ground	5.97	m3	Logarithmis	1.4049		
Plant based products other than fodder	biotic	597	kg	Logarithmis	1.07442445:		

Regionalised LCI Dataset
Coffee in Costa Rica (extrapol.)

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Produkte

Outputs zur Technosphäre. Produkte und Koppelprodukte	Menge	Einheit	Menge	Allokation	Abfalltyp	Kategorie
Coffee, green beans (Arabica), at farm (WFLDB 3.1)/CR U	597	kg	Mass	100 %	nicht definier	_WFLDB 3.1...\Coff
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Outputs zur Technosphäre. Substituierte Produkte	Menge	Einheit	Verteilung	SA^2 oder 2	Min	Max	Kommentar
(Zeile hier einfügen)							

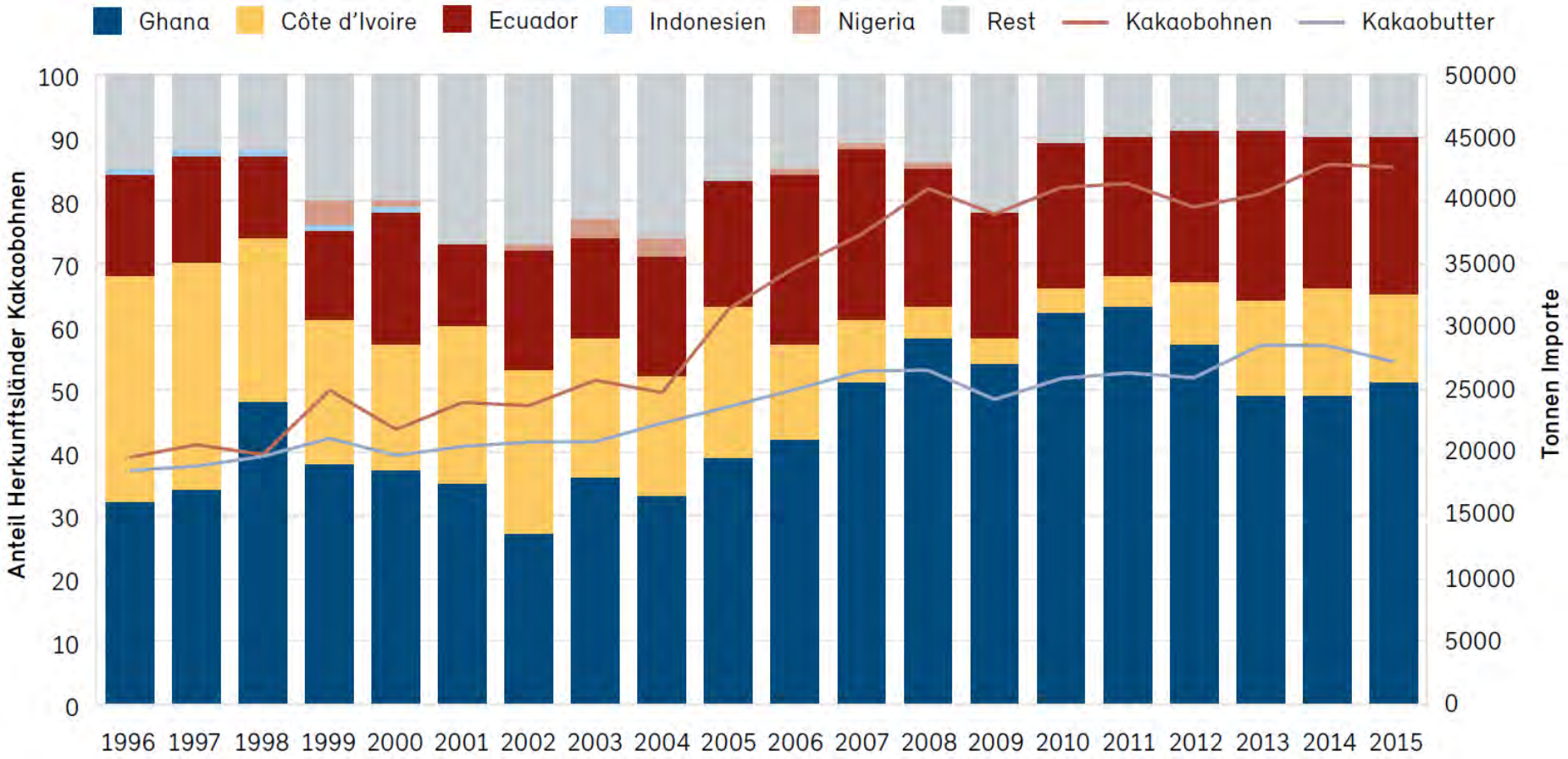
Input

Bekannte Inputs aus der Natur (Ressourcen)	Sub-Kompartiment	Menge	Einheit	Verteilung	SA^2 oder 2	Min
Occupation, permanent crop, fruit, CR	land	7057.021993	m2a	Logarithmis	1.113	
Transformation, from permanent crop, fruit	land	351.9009671	m2	Logarithmis	1.2077	
Transformation, to permanent crop, fruit	land	351.9009671	m2	Logarithmis	1.2077	
Carbon dioxide, in air	in air	750.02	kg	Logarithmis	1.0744	
Energy, gross calorific value, in biomass	biotic	7945.2	MJ	Logarithmis	1.0744	
Water, river, CR	in water	76.04617759	m3	Logarithmis	1.4049	
Water, well, in ground, CR	in water	4.002347749	m3	Logarithmis	1.4049	
Water, unspecified natural origin, CR	in ground	7.211546212	m3	Logarithmis	1.4049	
Plant based products other than fodder	biotic	597	kg	Logarithmis	1.07442445:	

Imports for Exported Food Products: Cheese & Chocolate

- Chocolate and cheese are important export products
- Some key ingredients of exported food products are imported
  - Cheese (and dairy products): soy bean cake used as feed
  - Chocolate: cocoa and cocoa butter
- LCI time series for provenience of imported key ingredients according to 1996-2015 trade statistics

Imports
Cocoa Beans and Butter



Biodiversity Footprint 1996-2015
Country Contributions

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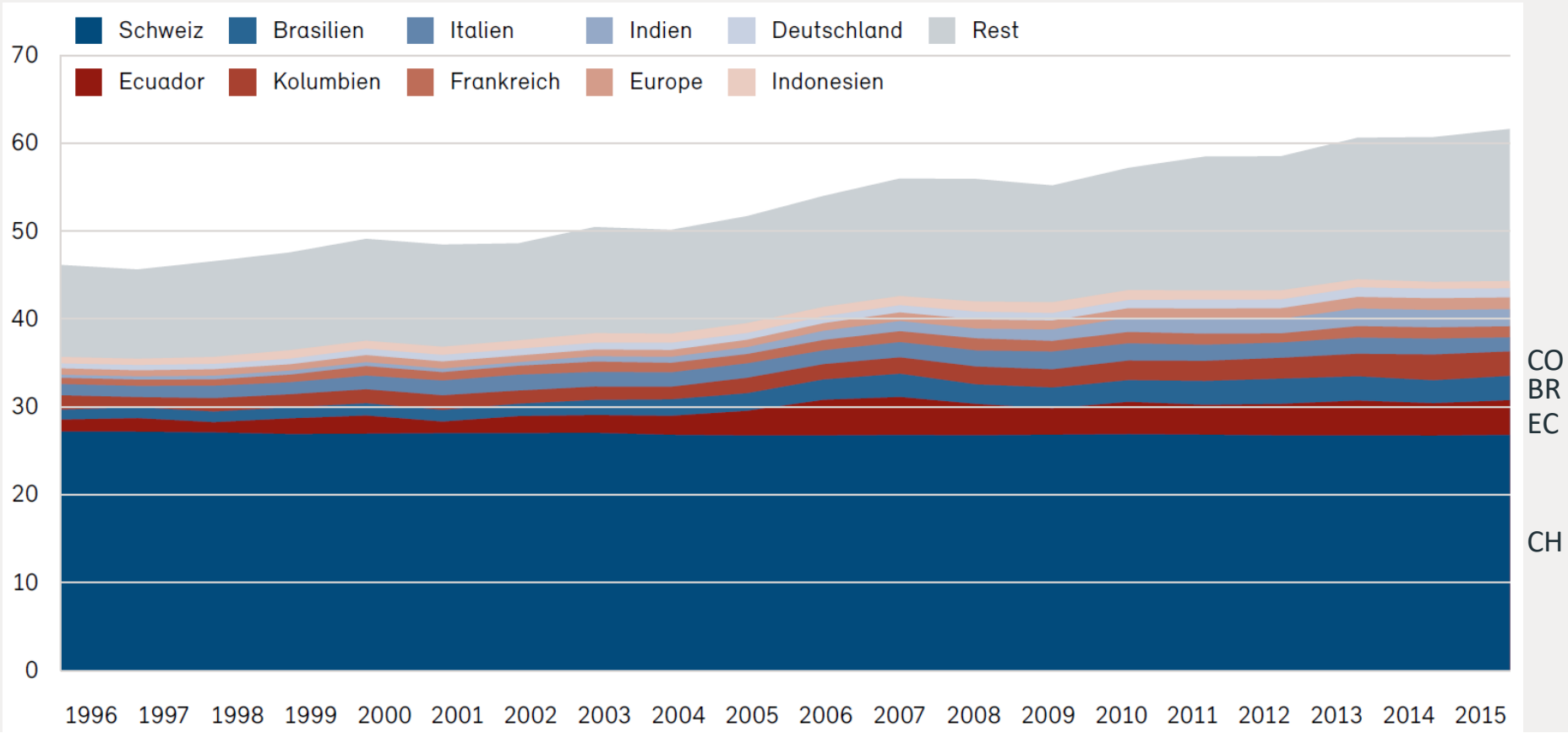
Method: Potential species loss due to land use (Chaudhary et al. 2016)
Unit: Micro-PDF·a



Biodiversity Footprint 2015
Country contributions

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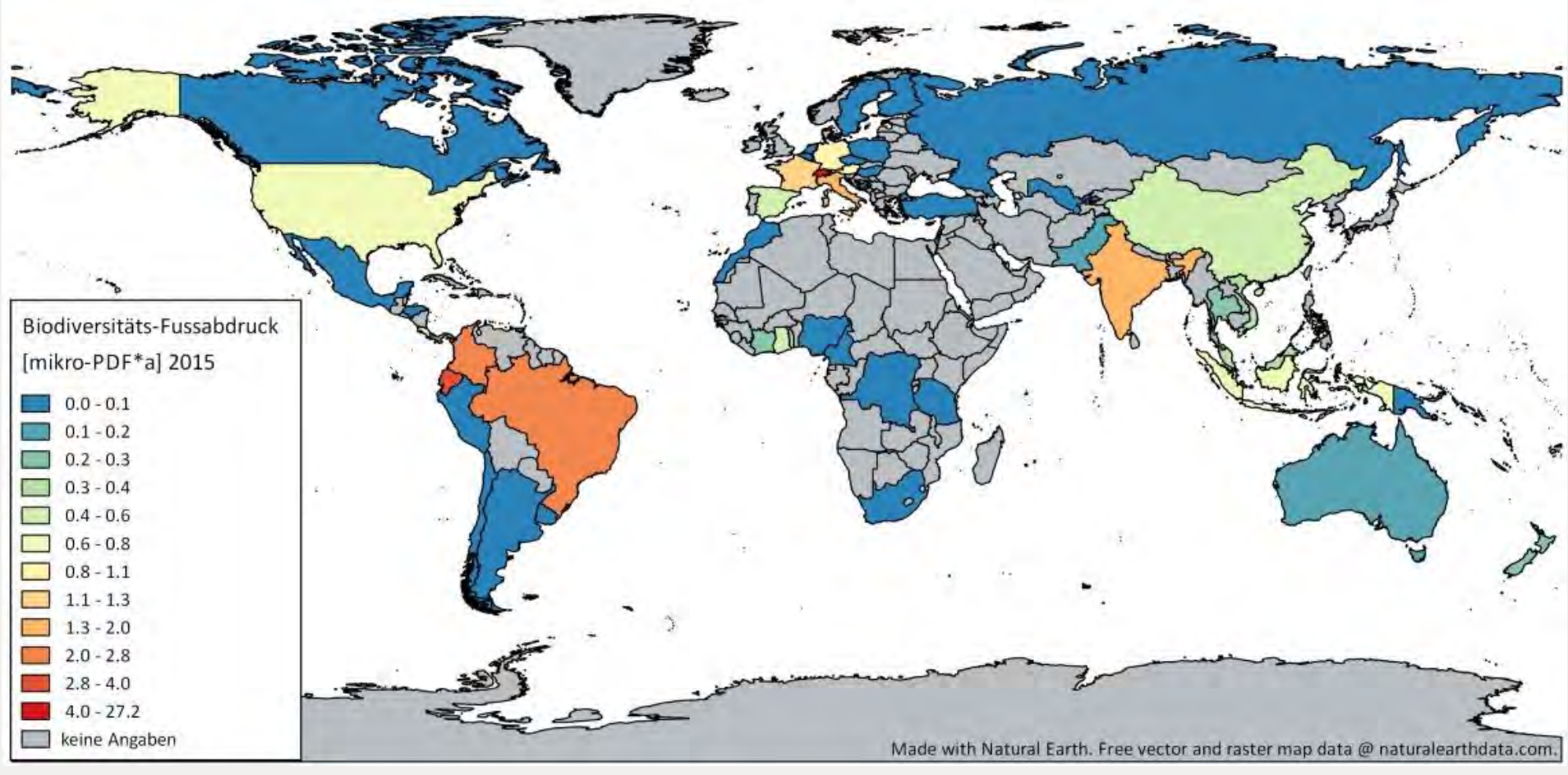

Biodiversity Footprint 1996-2015
Net Trade Impacts

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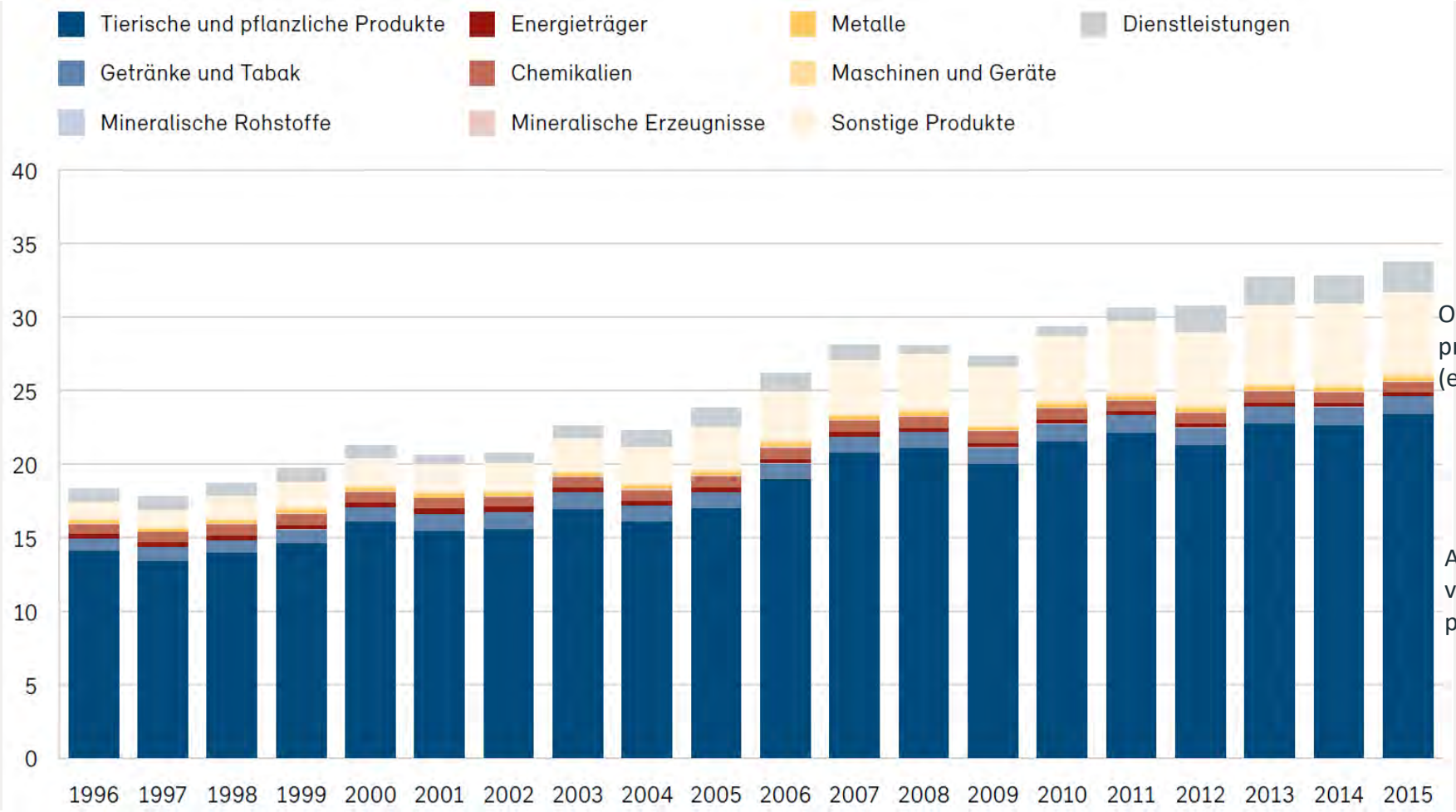

Conclusions & Outlook

- Regionalisation of time series of LCI data is possible but challenging
- Pay attention to interdependency between imports and exports (cocoa, cheese)
- Implementation requires numerous new elementary flows (or flow properties)
- Commercial LCA softwares seem not prepared for more efficient solutions