Global environmental impacts of consumption and production in Switzerland from 1996 to 2011

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Overview

- Starting point and research questions
- Model and methods
- Eutrophying impacts of Swiss consumption
- Model comparison
- Planetary boundaries applied on Eutrophication
- Conclusions
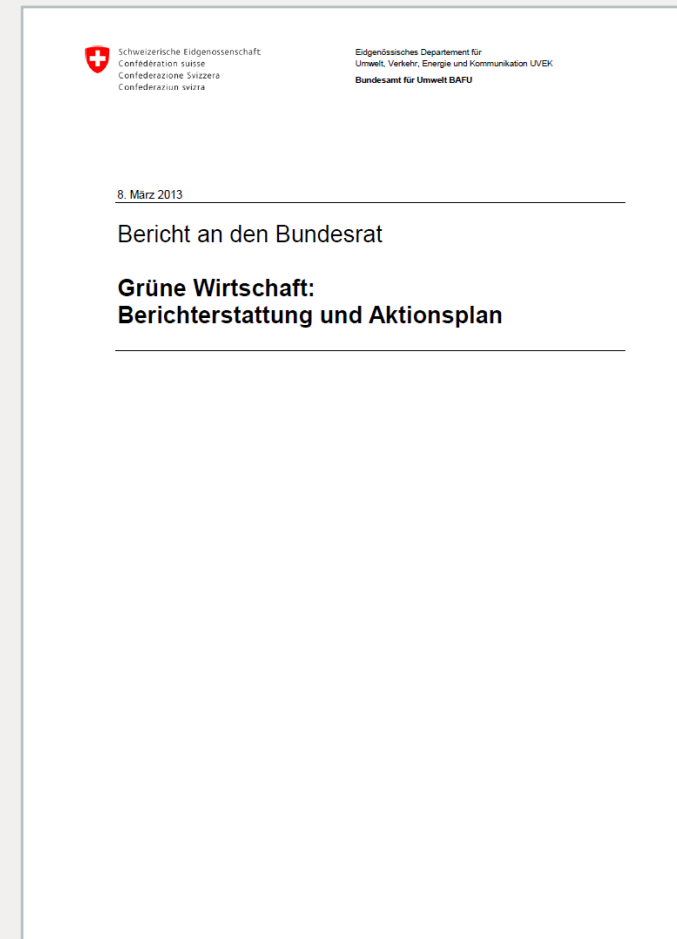
Swiss Federal Policy
Action plan «Green economy»

27 individual measures in the areas:

- Consumption and production

- Wastes and resources

- Comprehensive instruments

- Goal, measurement, information, reporting
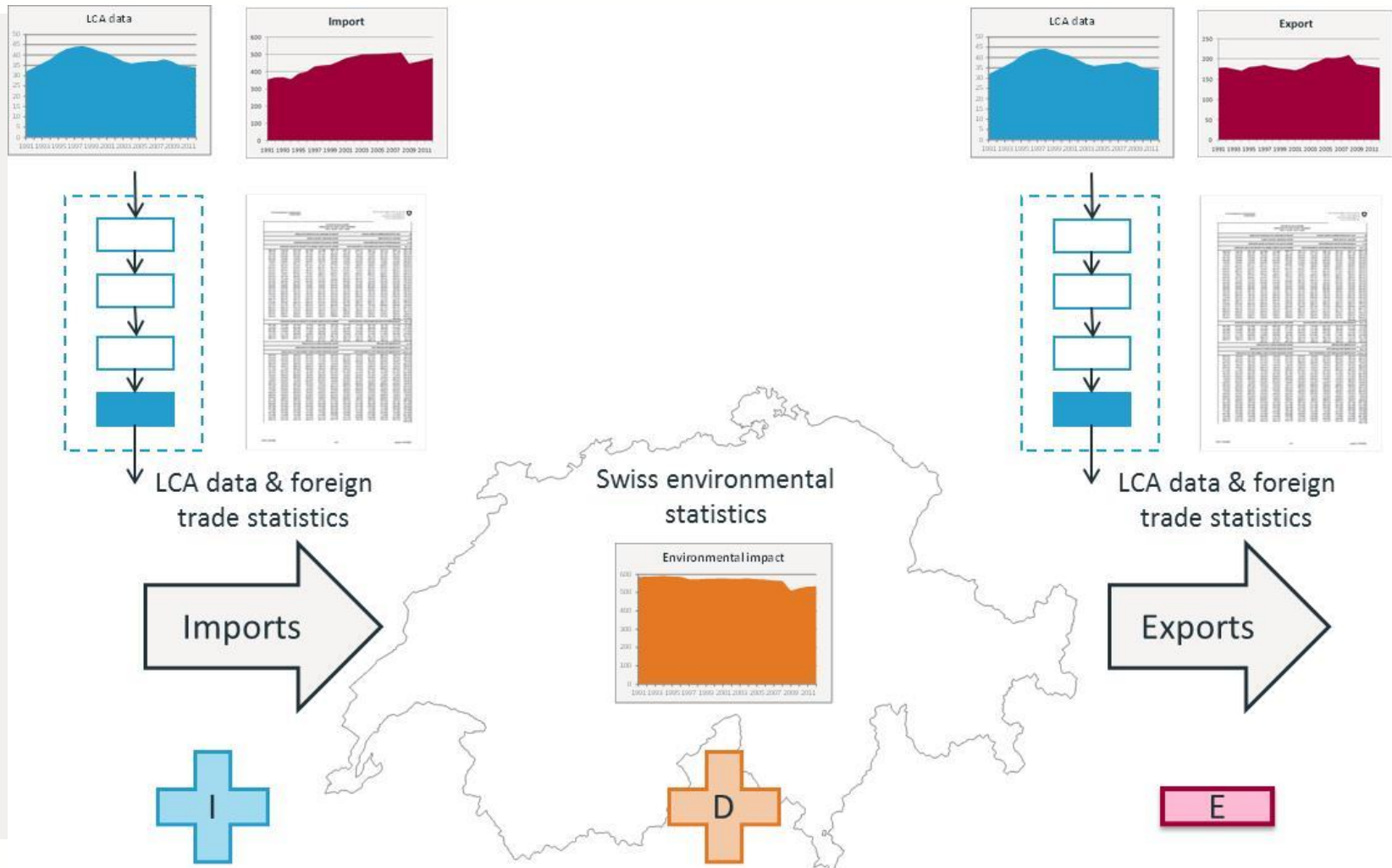 Measure 23:
  Define goals and reporting

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement für
Umwelt, Verkehr, Energie und Kommunikation UVEK
Bundesamt für Umwelt BAFU

8. März 2013

Bericht an den Bundesrat

Grüne Wirtschaft:
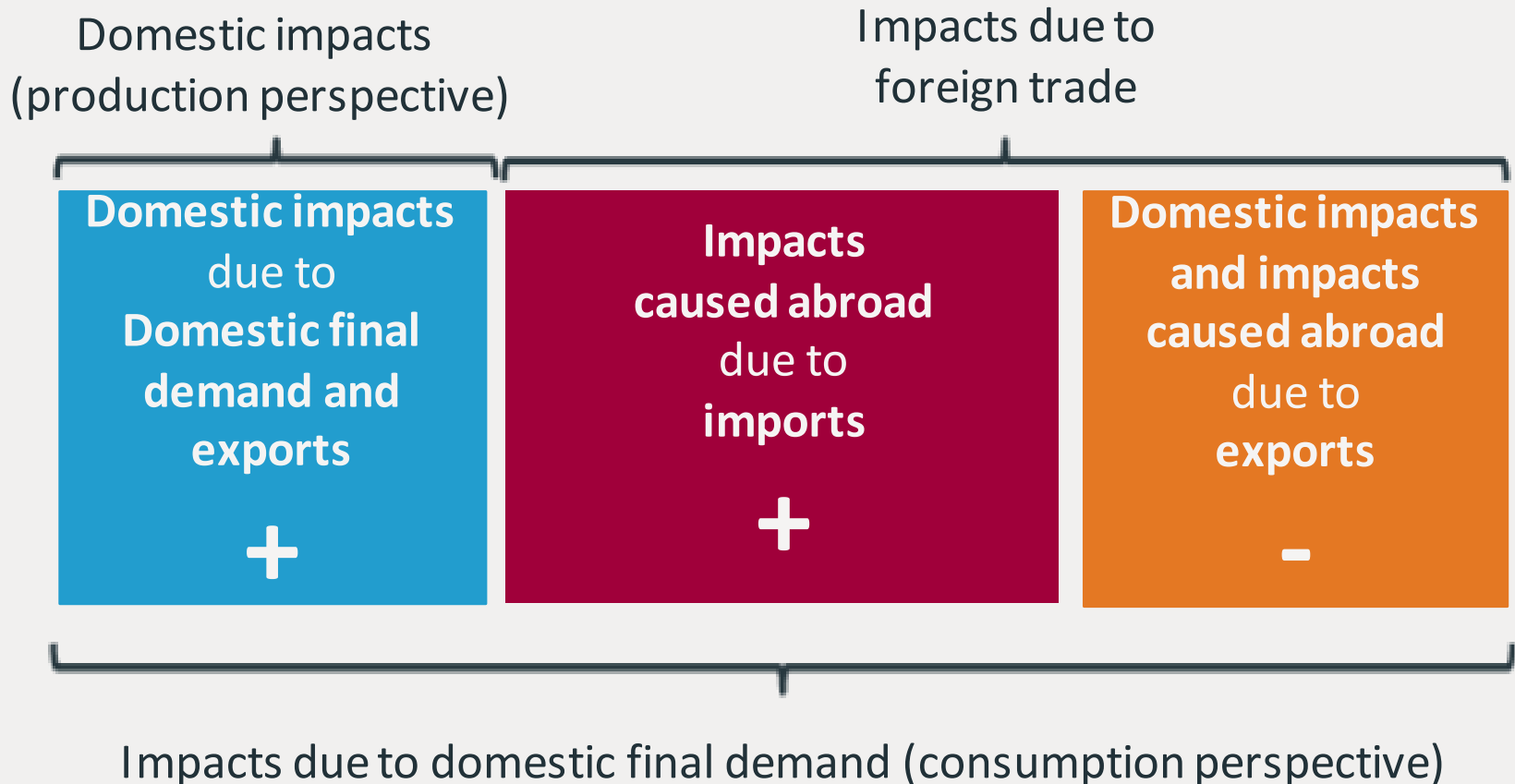**Berichterstattung und Aktionsplan**

Research questions

- How did Swiss domestic and consumption based environmental impacts develop since 1996?

- How did the shares between domestic, imported and exported environmental impacts develop?

- How do the results differ using two different models

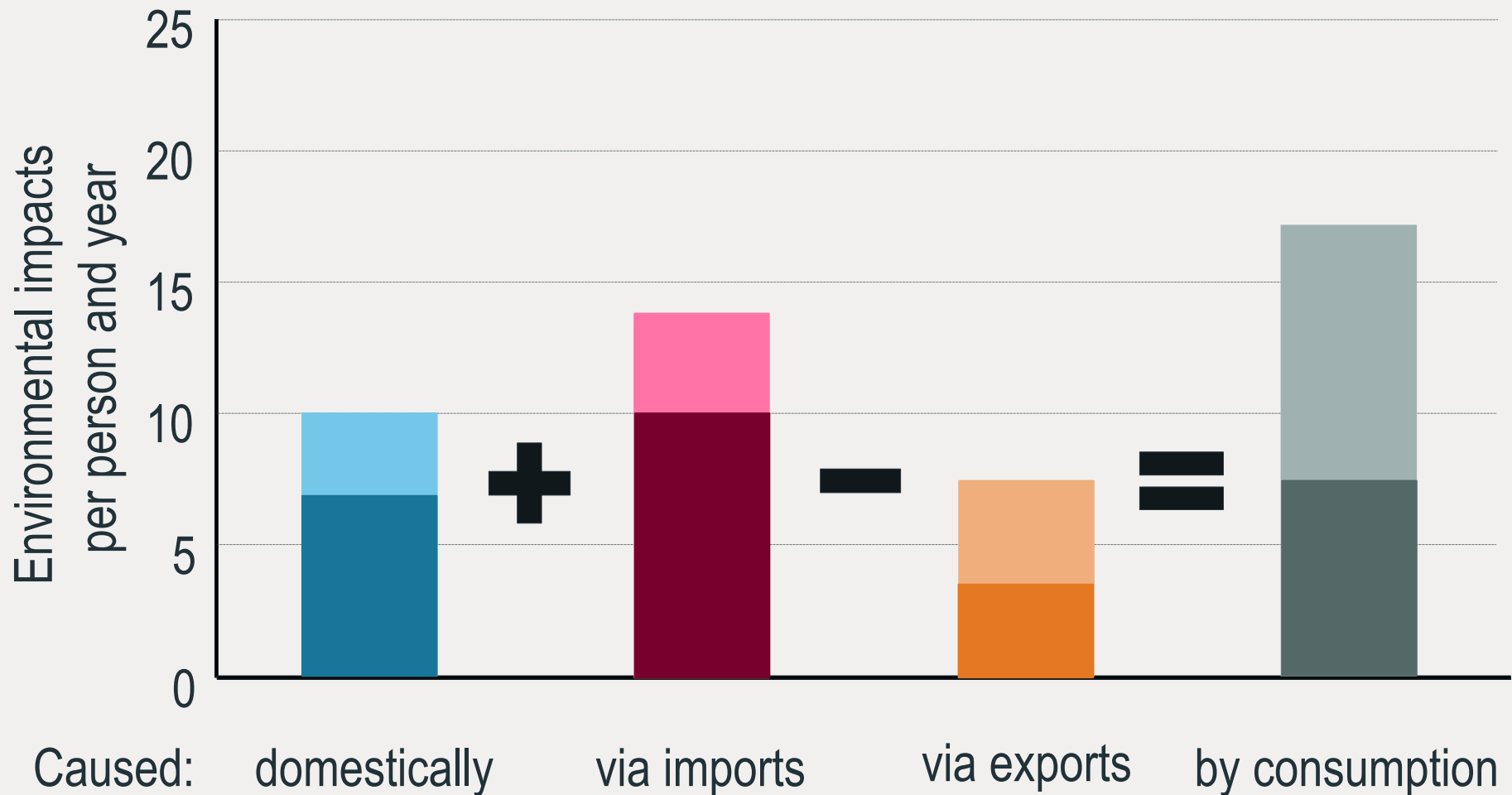- Do the environmental impacts of Swiss consumption **exceed planetary boundaries**?

Basic scheme of the model

Consumption versus Production perspective

Domestic impacts
(production perspective)

Impacts due to
foreign trade

Domestic impacts due to **Domestic final demand and exports**

+

Impacts caused abroad due to **imports**

+

Domestic impacts and impacts caused abroad due to **exports**

-

Impacts due to domestic final demand (consumption perspective)

Domestic and foreign impacts

Caused: domestically   via imports   via exports   by consumption

# consumption based environmental impacts

domestic

$$E_{c-b,d} = \frac{E_d}{E_d + E_i} \times (E_d + E_i - E_e)$$

foreign (abroad)

$$E_{c-b,a} = \frac{E_i}{E_d + E_i} \times (E_d + E_i - E_e)$$

$E_{c-b,d}$ domestic consumption-based environmental impacts,

$E_{c-b,a}$ foreign (abroad) consumption-based environmental impacts,

E_d domestic environmental impacts,

E_i imported environmental impacts

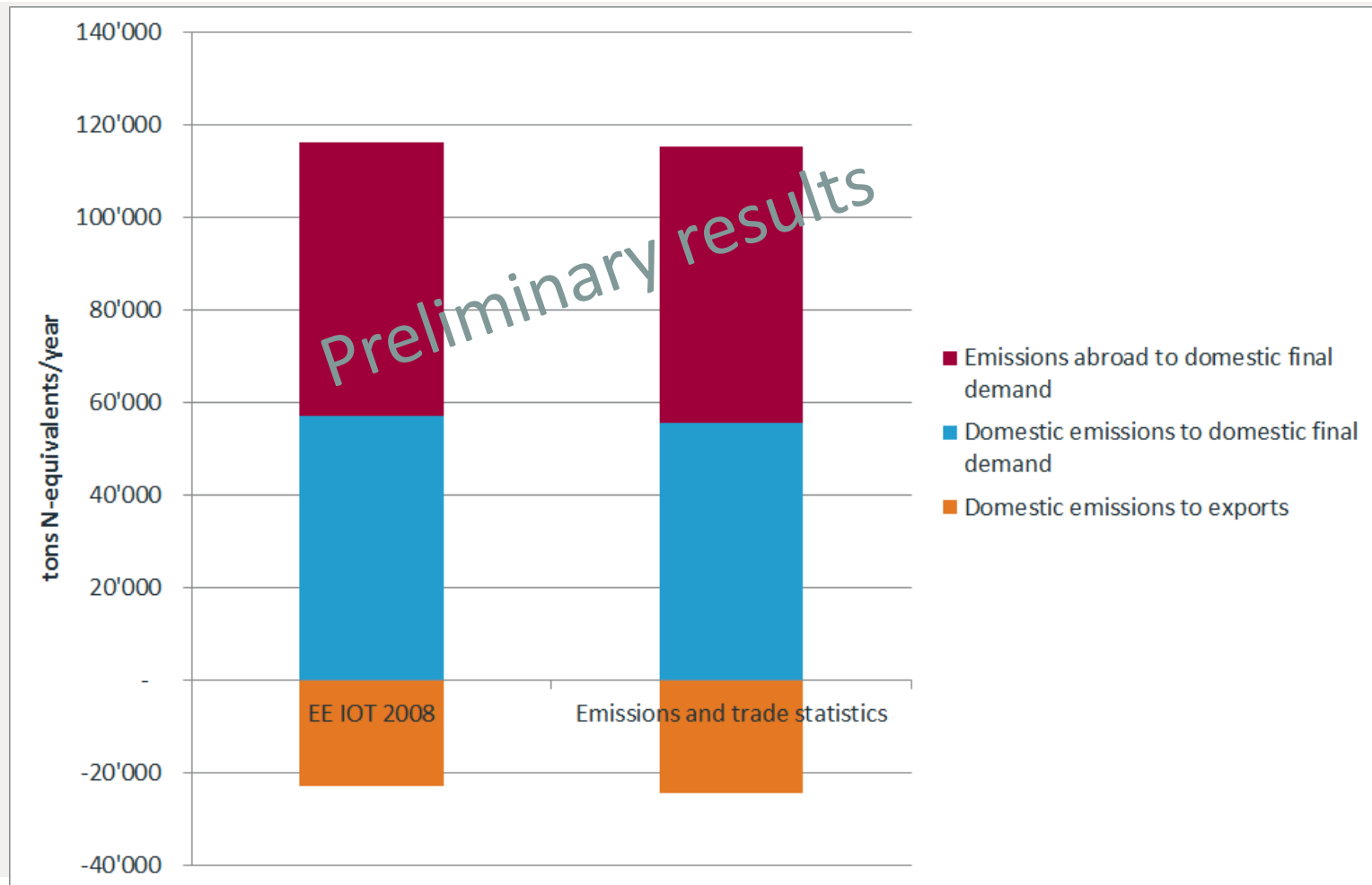E_e exported environmental impacts

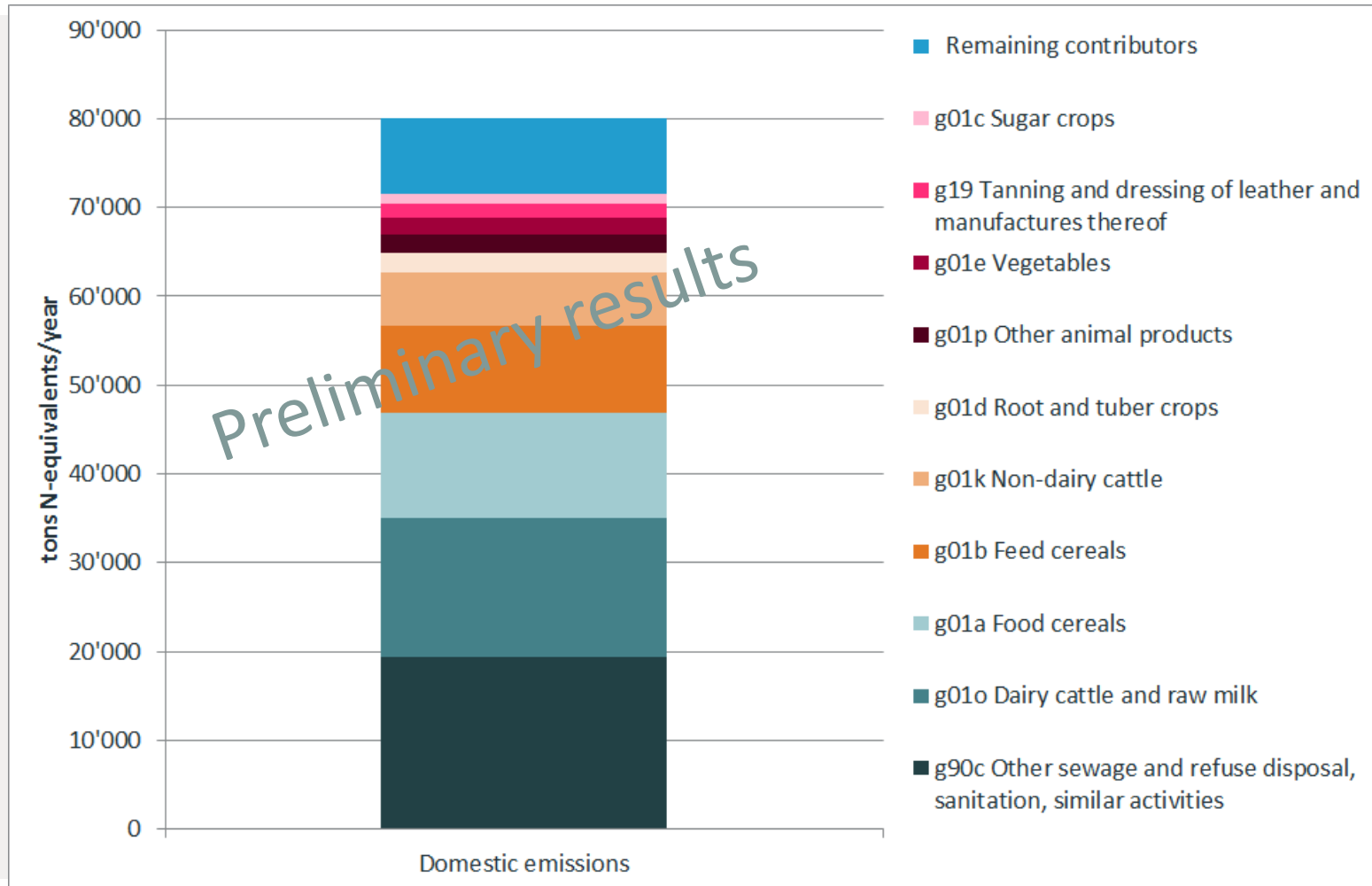# Trend in marine eutrophication caused by Swiss consumption
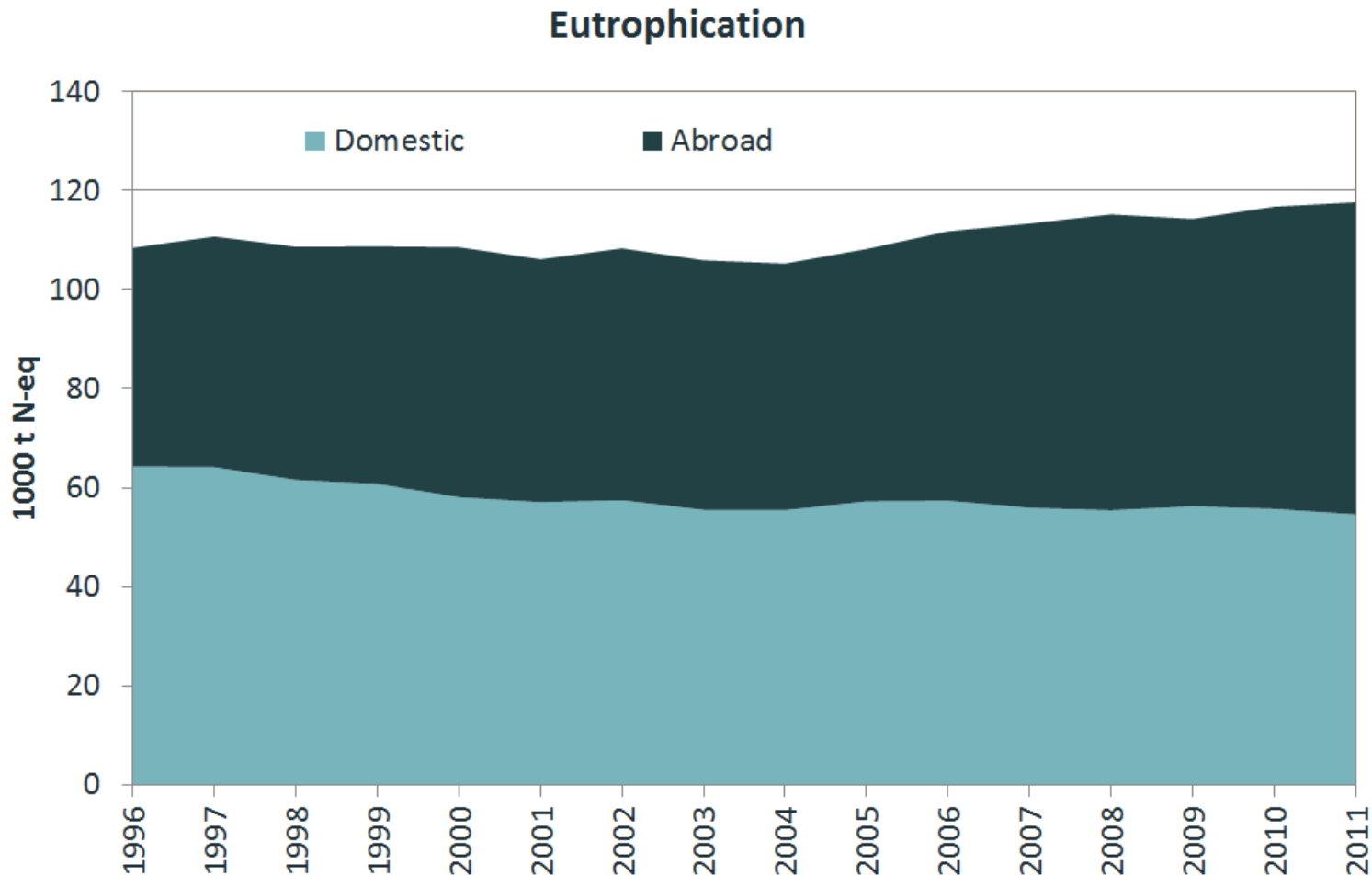
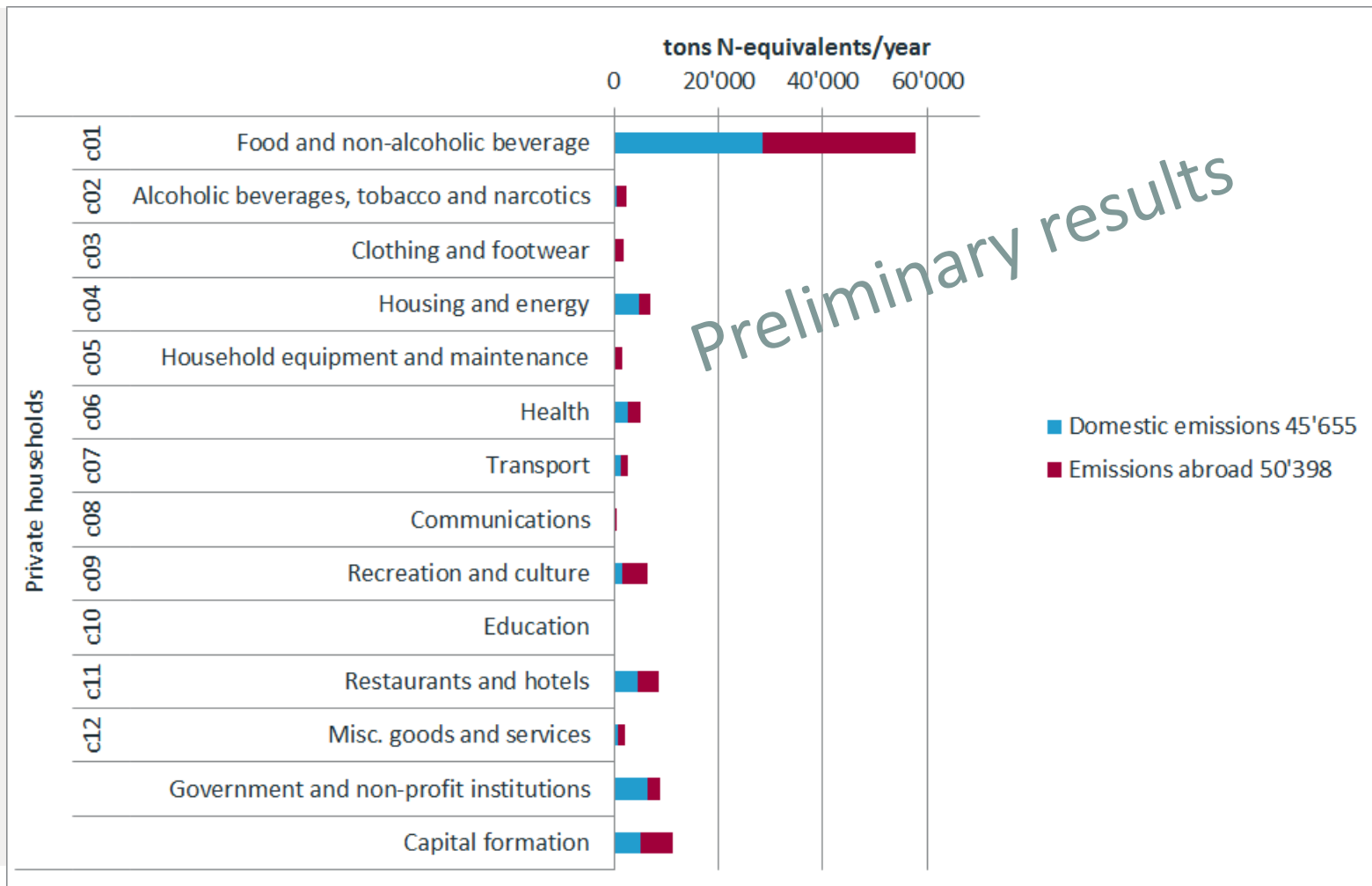# Trend in marine eutrophication: imports and exports
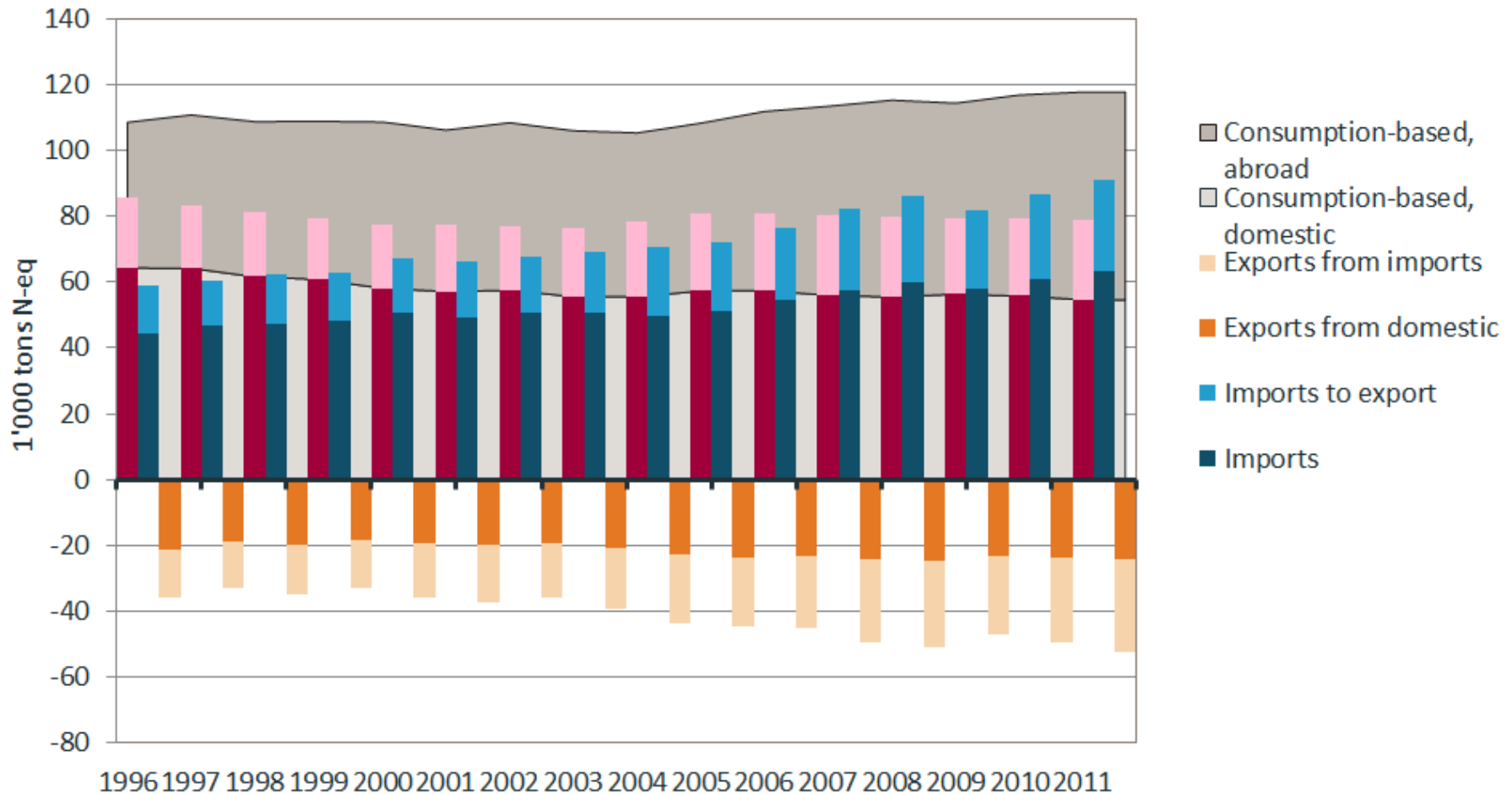
Eutrophication in 2008: Comparison of two approaches

Eutrophication in 2008: Domestic emissions

Eutrophication in 2008: Consumption categories

Sustainable level of N footprint?

- Are 117'000 tons N-eq emissions per year due to Swiss consumption sustainable (within a safe operating space)?

How to define a limit value for of consumption based eutrophication impacts based on planetary boundaries:
An alterntative approach to Dao et al. (2015)

Approach: domestic and global planetary boundaries

- Subdivide emissions into foreground (national) and background (global) part

- **Reduction of domestic (Swiss) emissions** of nitrogen compounds (leading to marine eutrophication):
Swiss environmental laws and **OSPAR** convention: **minus 40 %**

Approach: domestic and global planetary boundaries

- **trade related (global) emissions** of nitrogen compounds:
  Equal per capita target for all earth-dwellers

- **Steffen** et al. 2015 (Science):
  Global target N-fixation: 8.5 kg/cap/a
  Swiss share: 73'000 tons N/a

- Global N-fixation due to Swiss consumption today: 426'000 tons N/a

- **Reduction of trade related (global) emissions: minus 82 %**

Planetary boundary of Swiss con-sumption based eutrophication
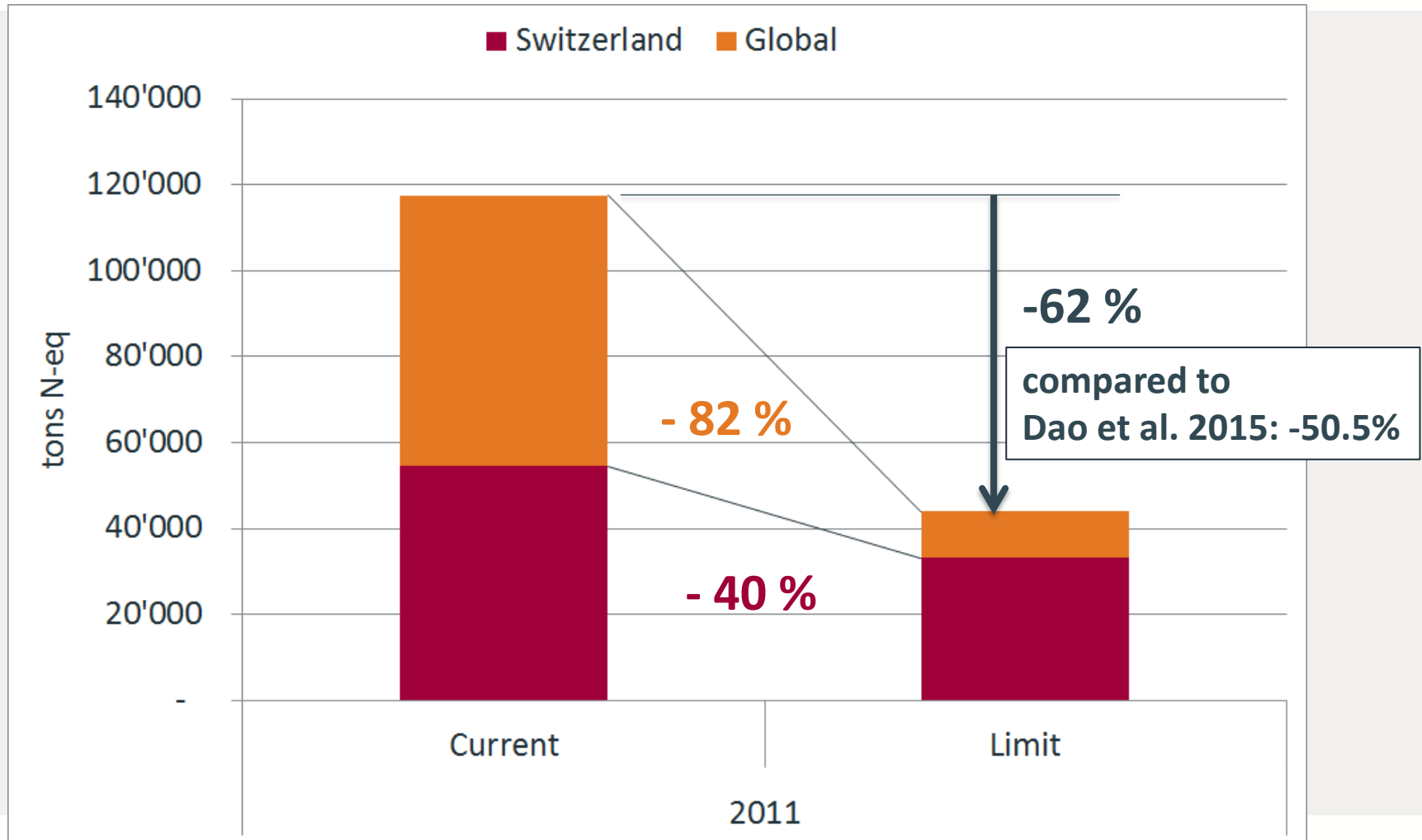
Conclusions

- Consumption based eutrophication impacts in 2011 higher compared to 1996

- increase in impacts abroad overcompensate the decrease in domestic impacts

- Cumulative emissions based on two approaches (IOT and trade statistics) are very similar

- Eutrophication impacts need to be reduced by nearly **two third** to comply with planetary boundaries

- Eutrophication-Limit similar but slightly stricter than with original approach (Dao et al. 2015)

Thank you very much for your attention!

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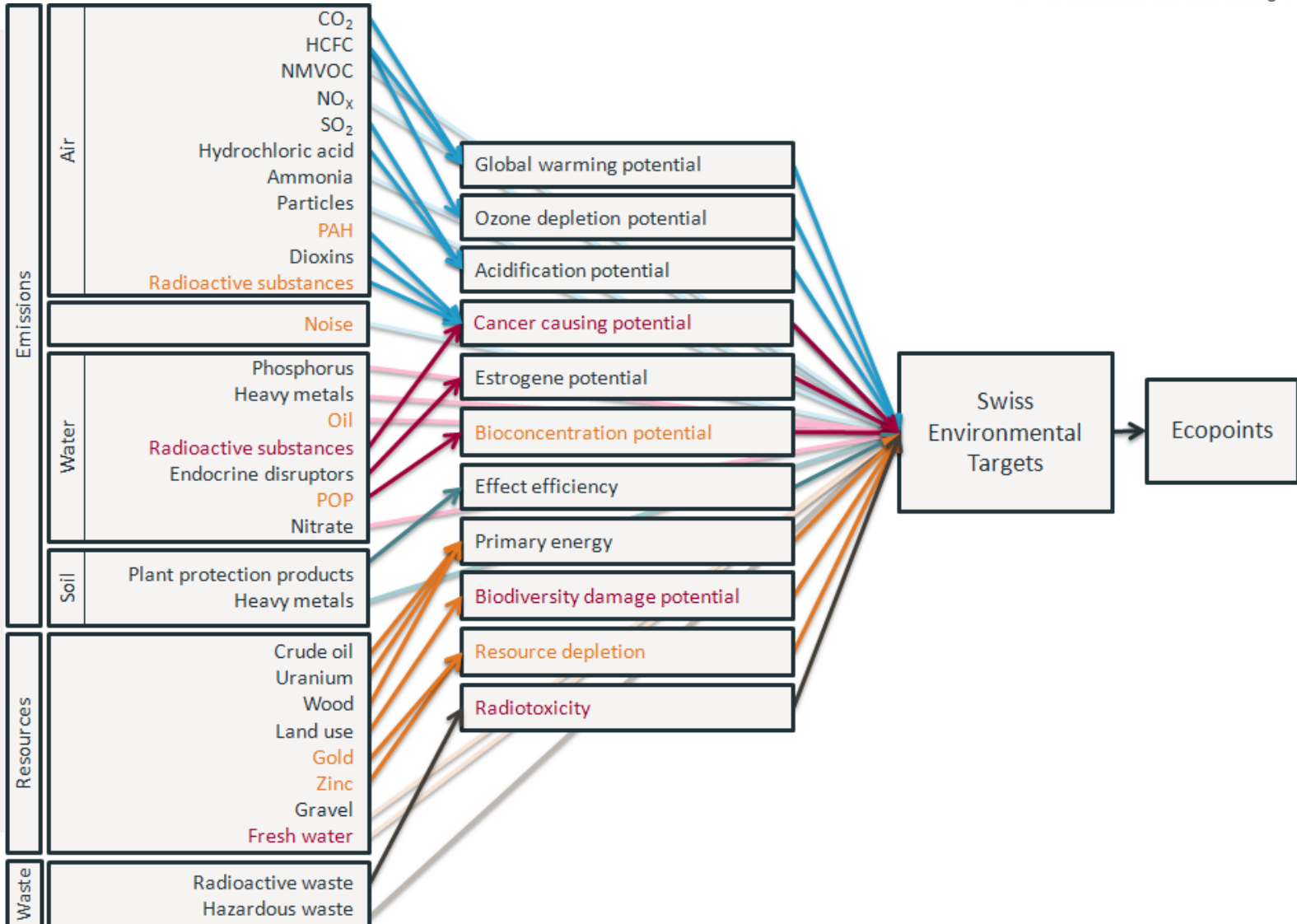
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Environmental impacts quantified with Swiss ecofactors '13

The ecological scarcity formula: Distance to target

$$\text{Eco - factor} = \underbrace{K}_{\substack{\text{Characterization} \\ \text{(if applicable)}}} \cdot \underbrace{\frac{1 \cdot \text{UBP}}{F_n}}_{\text{Normalization}} \cdot \underbrace{\left(\frac{F}{F_k}\right)^2}_{\text{Weighting}} \cdot \underbrace{c}_{\text{constant}}$$

|		
K	=	Characterization factor of a pollutant or a resource
Flow	=	Load of a pollutant, quantity of a resource consumed or level of a characterized environmental pressure
F_n	=	Normalization flow: Current annual flow with Switzerland as the system boundary
F	=	Current flow: Current annual flow in the reference area
F_k	=	Critical flow: Critical annual flow in the reference area
c	=	Constant (10^{12}/a)
UBP	=	Eco-point: the unit of the assessed result

Environmental impacts
Consumption perspective
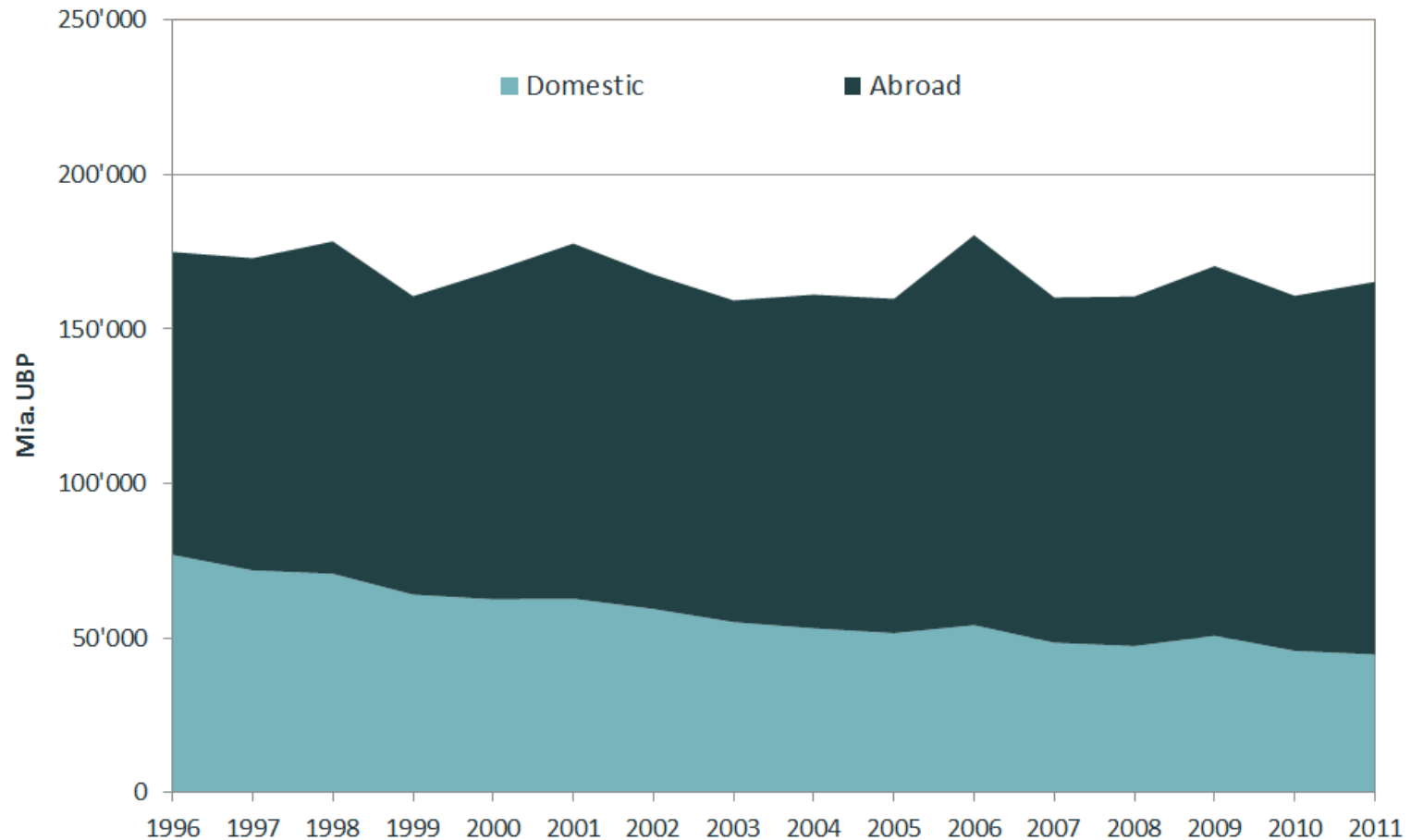
Environmental impacts
Imports and exports
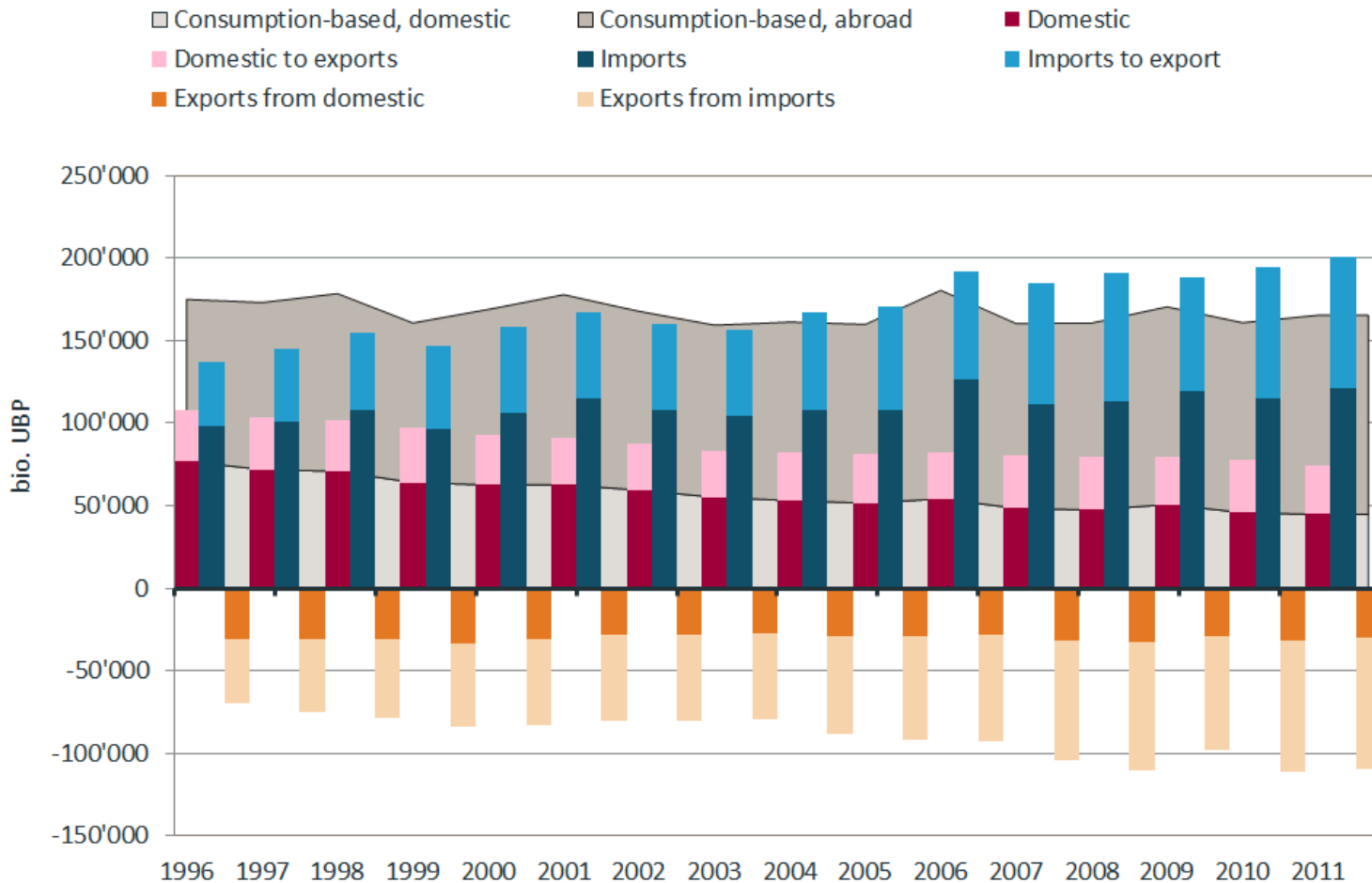
Trend in Nitrogen fixation due to Swiss consumption