Product Carbon Footprint for the GROHE BLUE® kitchen tap

International Sustainable Built Environment Conference
Doha, 28-30 January 2014

Tim Schröder
Prof. Dr. Jutta Geldermann

Chair of Production and Logistics
Georg-August-University Göttingen
www.produktion.uni-goettingen.de

Agenda

1. Introduction of Grohe AG and the GROHE BLUE® kitchen tap
2. Motivation for Product Carbon Footprint Analysis
3. Supply Chain and Life Cycle Net
4. Assumptions and Allocations
5. Results
6. Conclusion

Introduction

Georg-August-Universität Göttingen

- Roughly 26,000 students and 12,000 staff members
- Chair of Production and Logistics
- 16 Research Assistants working on current questions of sustainability and energy efficiency using methods of Operations Research
- Several LCA studies, e.g. for biogas

Source: http://www.uni-goettingen.de

GROHE

- Founded in 1948
- Producer of tapware
- Active in 130 countries, worldwide market leader
- 9,000 employees
- Revenues in 2012: € 1.405 billion

Source: grohe-group.com

The GROHE BLUE kitchen tap

- „Extension“ to regular kitchen tap
- Can be used to supply sparkling water which is
  - carbonated (two different settings)
  - cooled down to 4 - 8 °C
  - filtered

Source: www.grohe.com

Source: www.grohe.com

Source: smarthomes.de

Motivation

- The GROHE BLUE® system is sold praising its ecological advantages

Less Environmental Impact

GROHE Blue® combines convenience and a healthy lifestyle in one environmentally-conscious package. Compared to the pollution and energy consumption caused by filling and transporting bottled mineral water, filtering tap water has a negligible environmental impact. GROHE Blue® saves resources and money, since seven litres of water are needed to put just one litre of bottled water on a supermarket shelf. Energy is also saved, as heavy bottles no longer need to be carried home and time and resources spent recycling them.

Source: www.grohe.com

- Actual research about advantageousness has not been carried out before
- Customers ask for exact numbers on CO_2 savings
- Focus on GHG emissions as the most prominent impact factor

Geographic distribution of Supply Chain Members

Hemer
- Cartouche
- Final picking & packing

Albergaria
- Tap
- Intermediary picking & packing

Langenfeld
- Cooling Unit

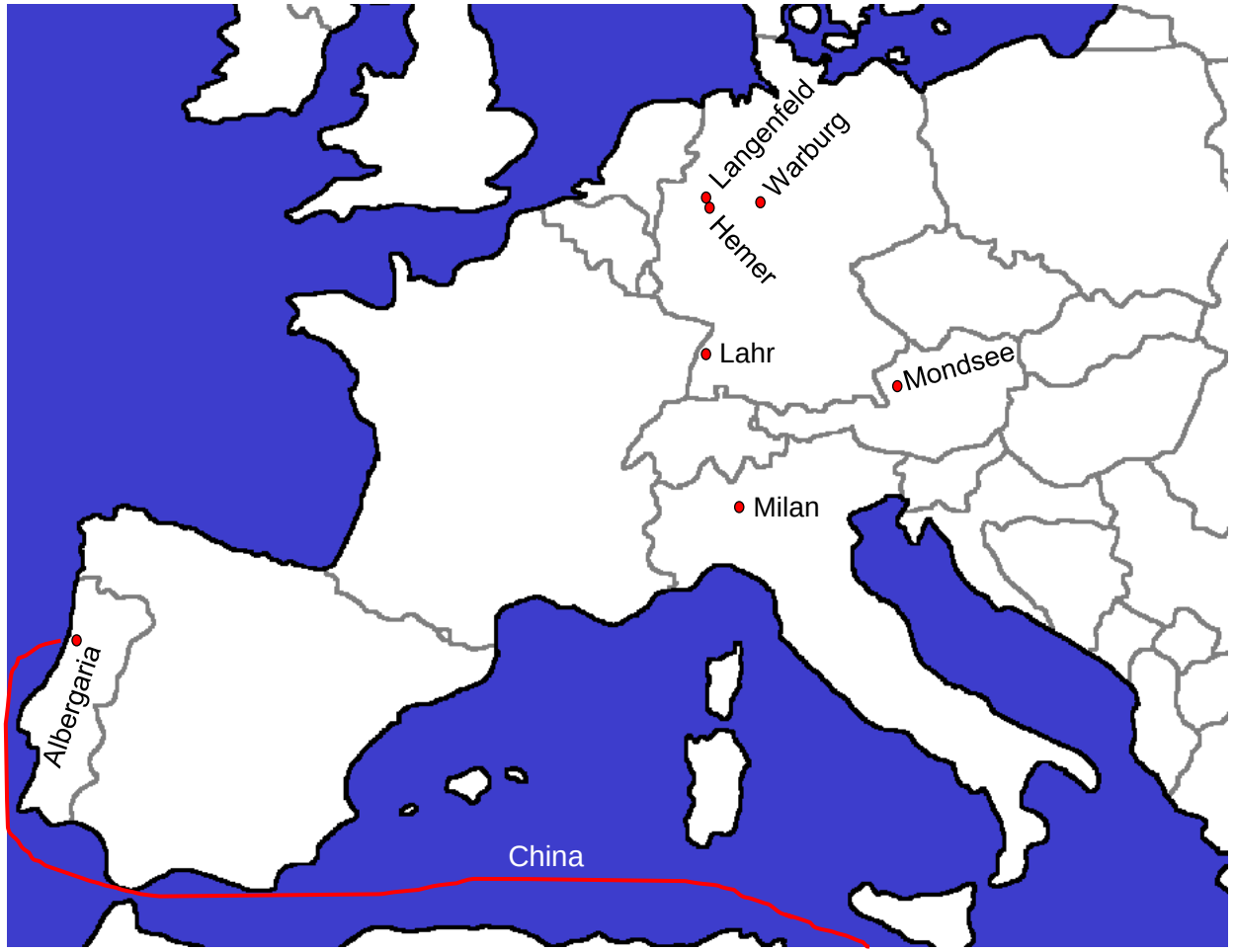
Mondsee
- Filter

Warburg
- CO_2 bottles

Lahr
- Cardboard

Milan (representing Italy)
- Seals

China
- Screws etc.

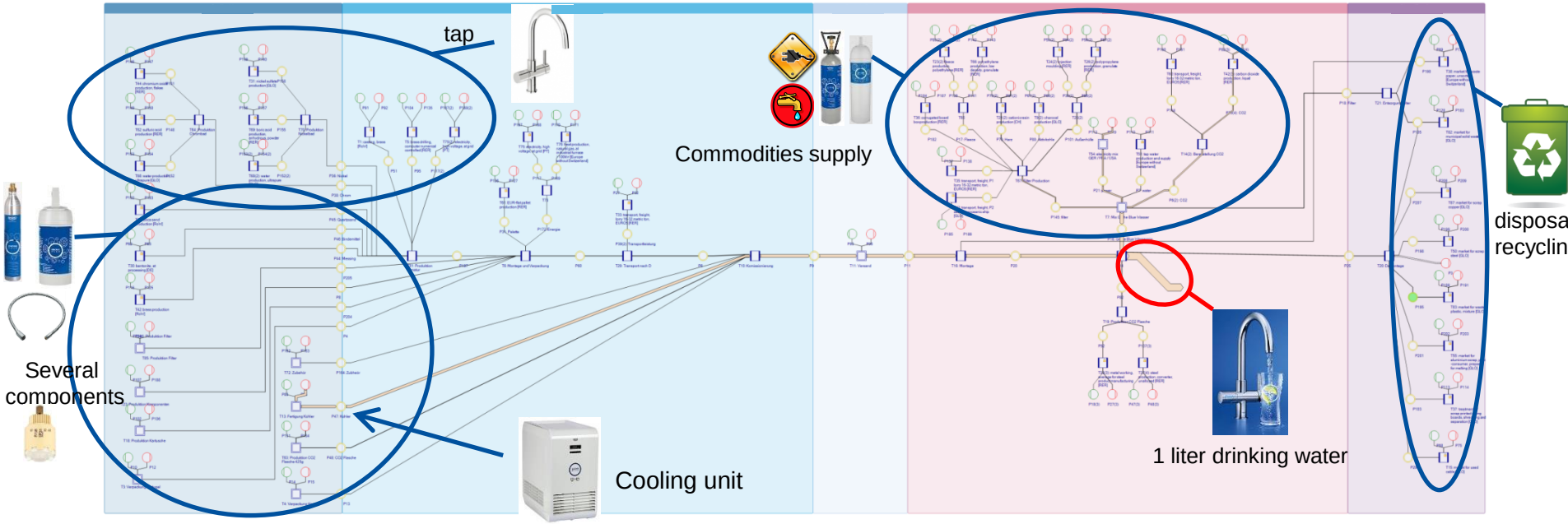


basemap: digitale-europakarte.de

Logos from: grohe.com; imi-cornelius.com; bwt.de; filltech.de; nestler-wellpappe.de

Umberto Modeling of the GROHE BLUE Kitchen Tap Life Cycle

- Petri-net modelling in Umberto NXT LCA
- Five Life Cycle Phases: Raw Materials, Manufacture, Distribution, Consumer Use and Disposal Recycling



Baseline Scenarios
Usage in Corporate Environment and Private Household

- Installation instead of regular kitchen tap

- Replacing drinking water supply in bottles or jugs

Scenario	Corporate Env.	Private Household
Number of users	30	4
Consumption per day p.c.	0.7	1
Number of days p.a.	220	365
Lifetime in years	5	10
Total consumption	33,000	10,220

Allocations
Which water option is consumed where?

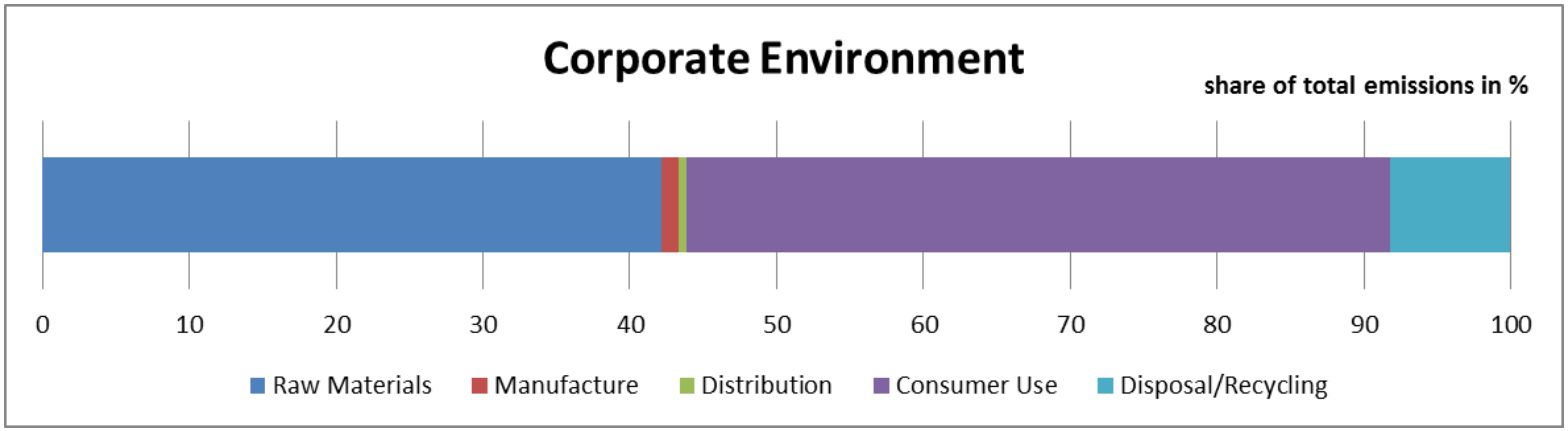
- Usage in different markets
  - Germany: 70%
  - France: 20%
  - USA: 10%

- Consumption of…
  - 40% strongly carbonated water
  - 40% medium carbonated water
  - 20% non-carbonated water

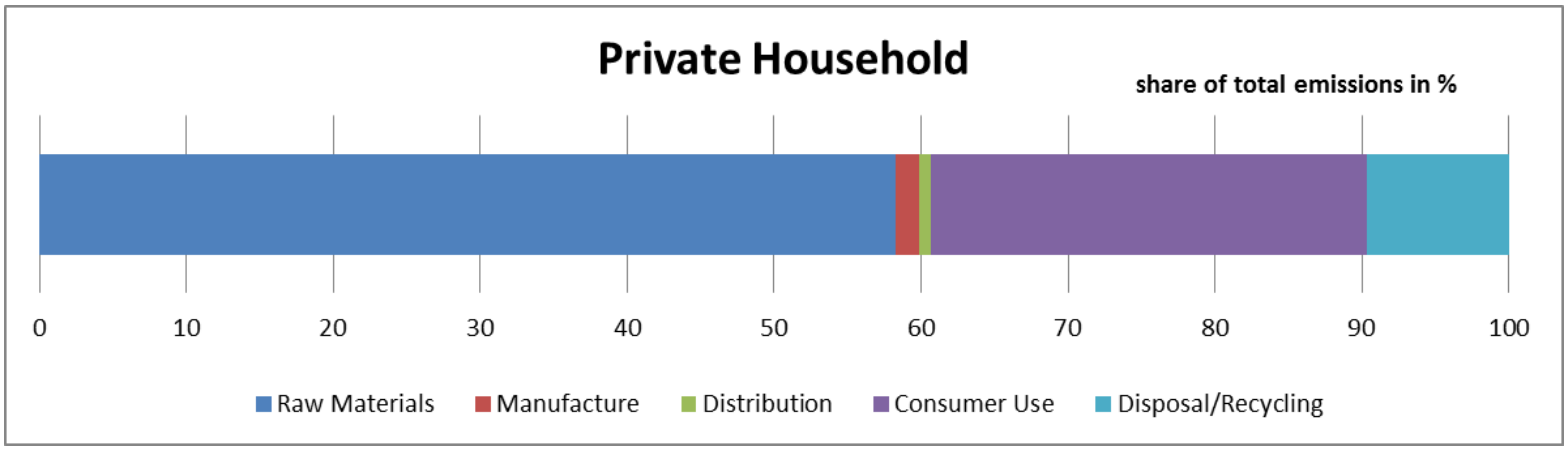
Source: hcgweightdropsblog.com

Results

- **17.96 g CO2-Eq / l** in a corporate environment



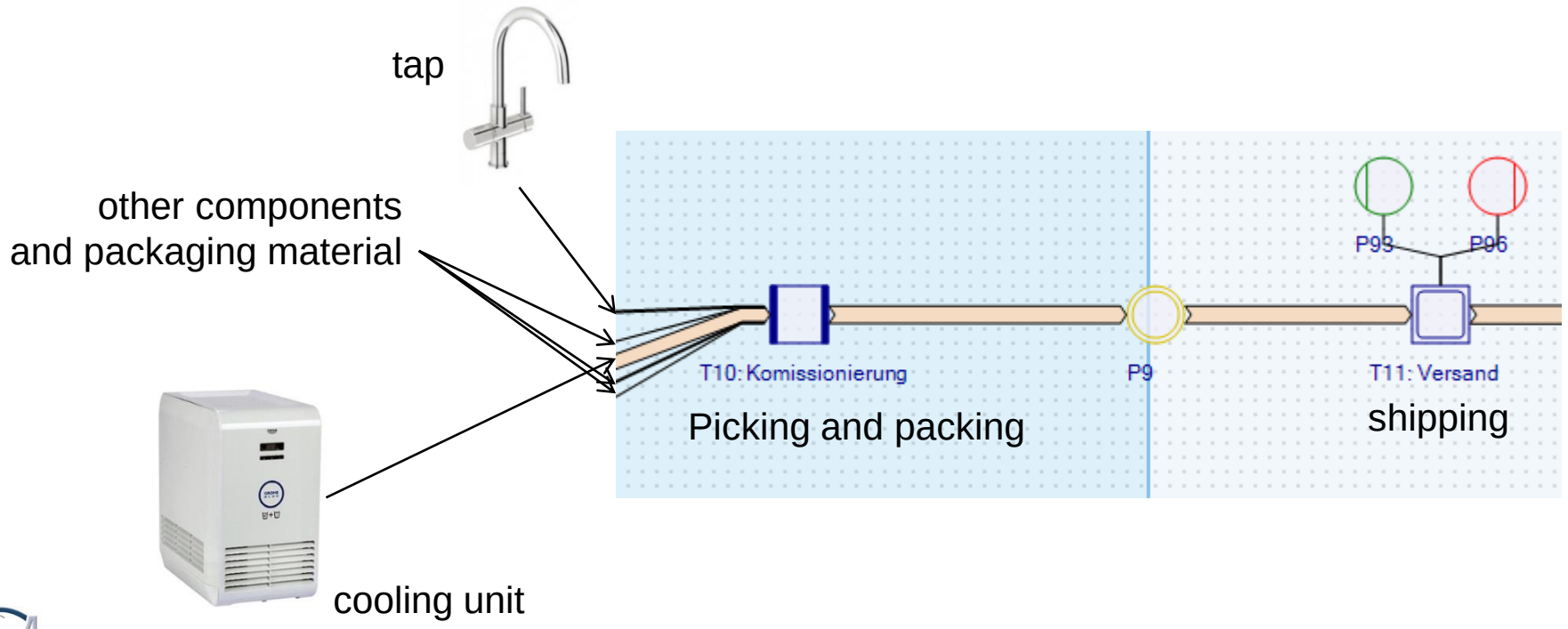
- **41.96 g CO2-Eq / l** in a private household



Production of the tap
Picking and Packing of all components

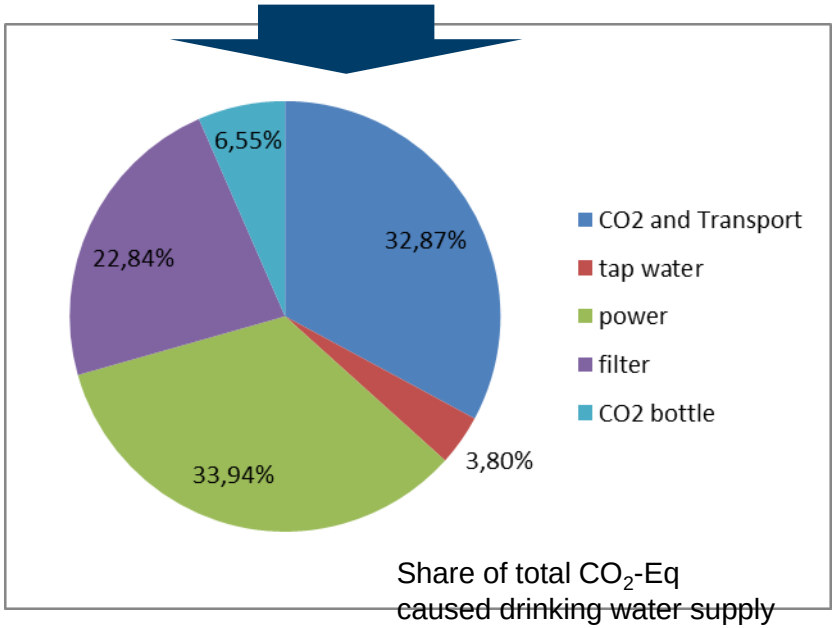
- Width of the arrows represents the amount of CO2-Emissions caused
  - One arrow responsible for majority of the emissions: cooling unit

- Cooling unit responsible for about 80% (6.16 of 7.77 g CO2-Eq / liter) of the emissions up to the shipping

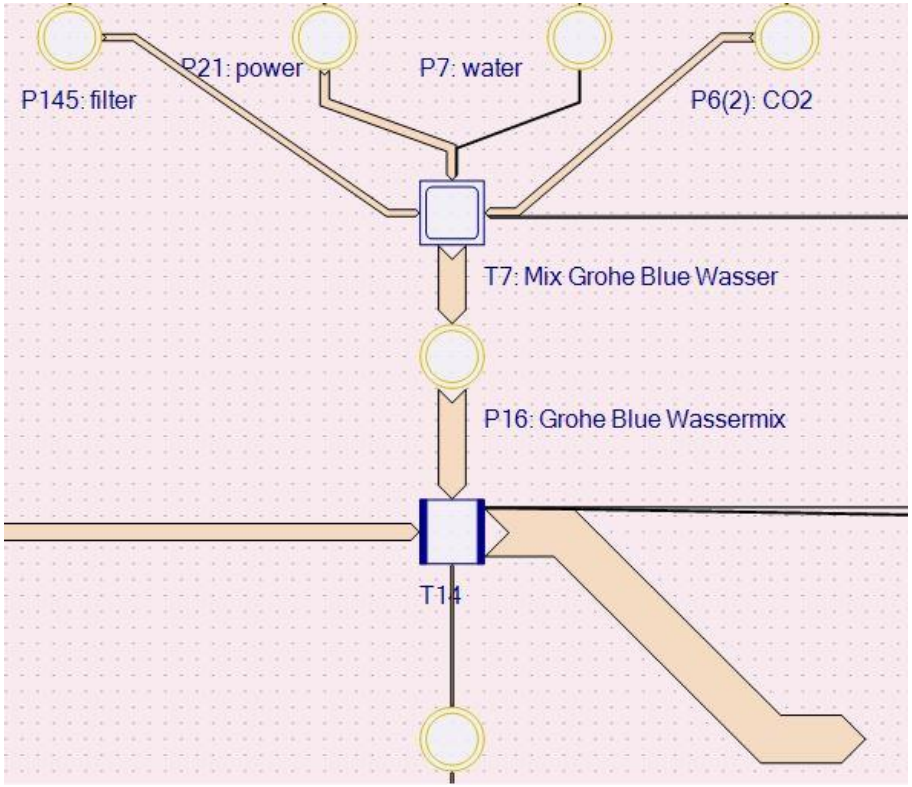


The Consumer Use Phase
Filtering and Carbonisation of Drinking Water

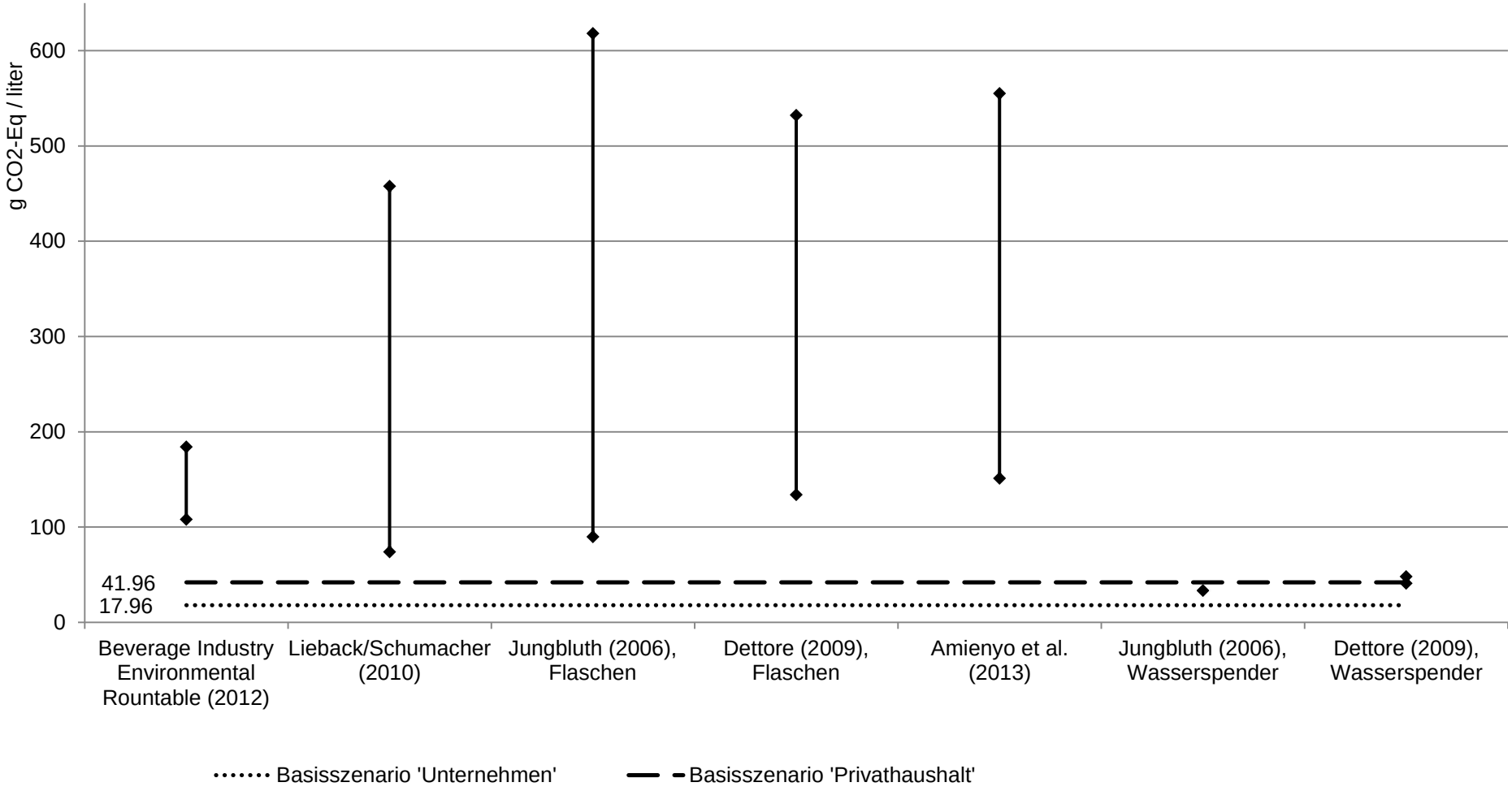
- In Transition T7: Composition of GROHE BLUE water mix, consisting of
  - 40% strongly carbonated water
  - 30% mildly carbonated water
  - 30% uncarbonated water
- Different uses of CO_2, other inputs do not alter



Share of total CO_2-Eq caused drinking water supply

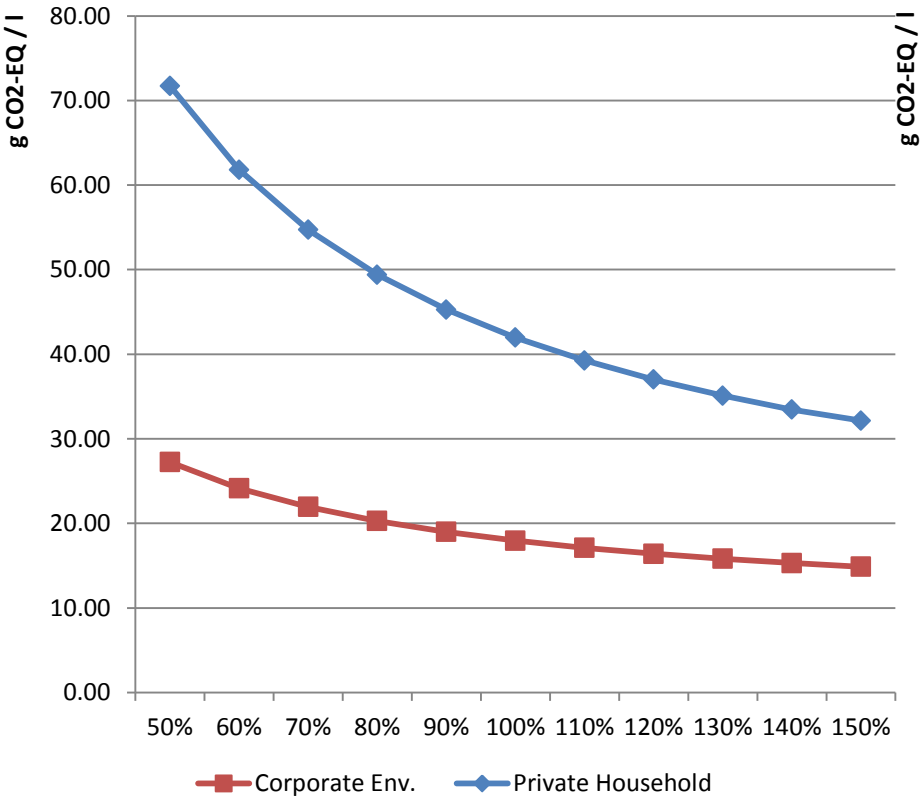


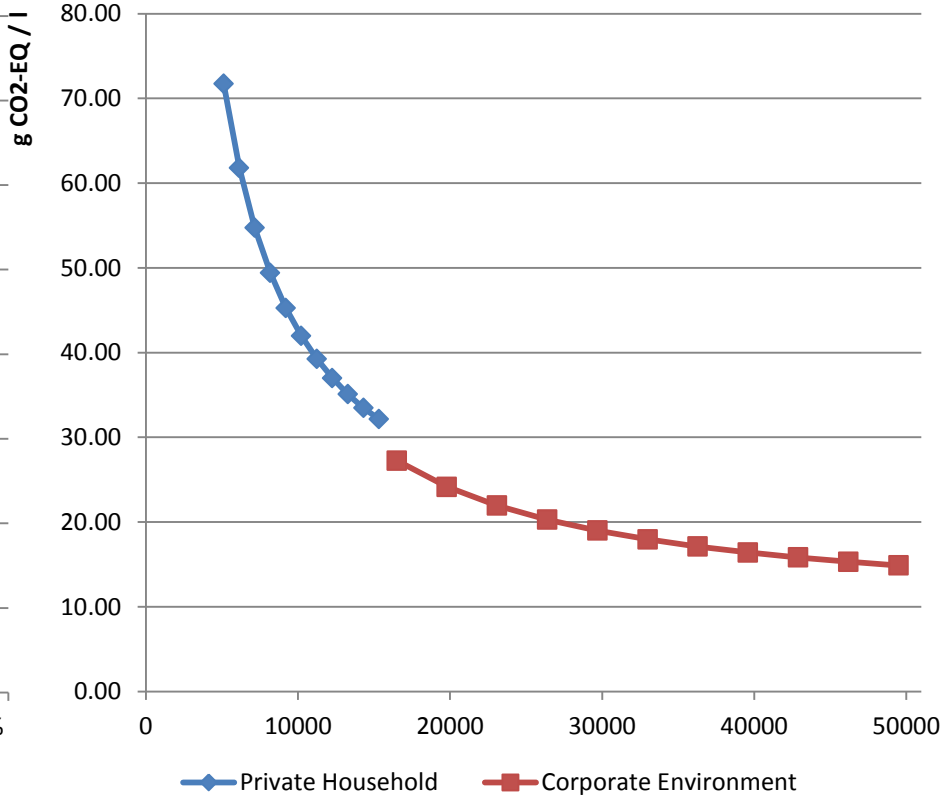
Comparator System
GROHE BLUE® drinking water has distinctly lower GHG Emissions



Sensitivity and Scenario Analysis
What has been investigated?

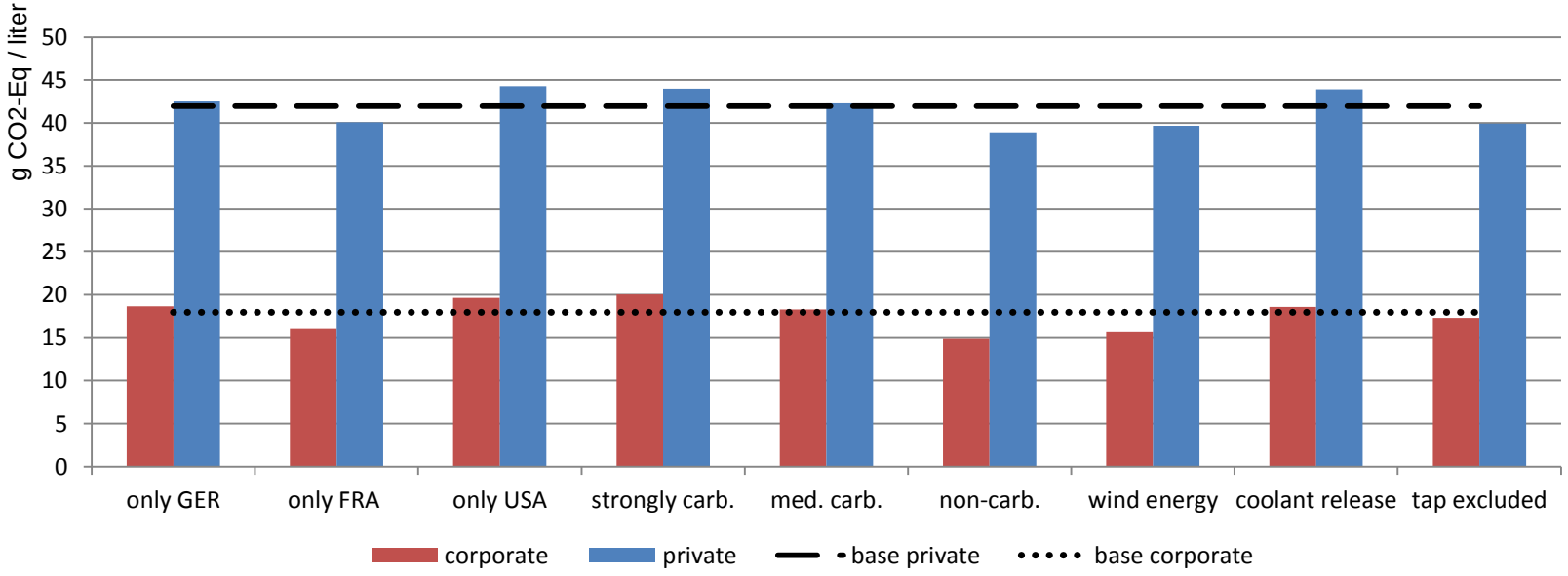
- Sensitivity Analysis
  - Variation of total amount of water consumed by +/- 50% in both scenarios





Scenario Analysis

- Scenario
  - release of the total amount of the highly climate damaging coolant (R134a)
  - All three markets set as single sales market
  - All three kinds of water set as only kind of water consumed
  - use of green power (wind power) in the consumer use phase
  - exclusion of the tap production.



Scenario analysis deviations compared to sensitivity analysis

- All scenarios calculated are very close to the base scenario results
- Largest deviations stem from variation of total water consumption by +/-50% (represented by box shaded in grey)

Conclusions

- Advantageousness in terms of GHG emissions of carbonated drinking water supply with a GROHE BLUE kitchen tap is evident and robust
- Largest contributors to the product carbon footprint are “Raw Materials” and “Consumer Use” phase, which account for about 90 % of the GHG emissions
- Customers’ requests for actual numbers of CO_2-Eq savings can be met
- General environmental friendliness can not be assessed conclusively since other environmental impacts were not analyzed

Contact

Tim Schröder
E-Mail: tim.schroeder@wiwi.uni-goettingen.de
Phone: +49 551 / 39 - 106 99

Prof. Dr. Jutta Geldermann
E-Mail: produktion@wiwi.uni-goettingen.de
Phone: +49 551 / 39 - 72 57

Chair of Production and Logistics
Platz der Göttinger Sieben 3
D – 37073 Göttingen

Literature

- Aniemyo, D., Gujba, H., Stichnothe, H., Azapagic, A. (2013): Life cycle environmental im-pacts of carbonated soft drinks, in: International Journal of Life Cycle Assessment, Vol. 18, Issue 1, January 2013, pp. 77-92.

- Beverage Industry Environmental Roundtable (2012): Research on the Carbon Footprint of Bottled Water, 2012, http://bieroundtable.com/files/Bottled%20Water%20Final%20DEP.pdf

- Dettore, C. G. (2009): Comparative Life Cycle Assessment of Bottled vs. Tap Water, Ann Arbor, 2012, http://css.snre.umich.edu/css_doc/CSS09-11.pdf

- Jungbluth, N. (2006): Vergleich der Umweltbelastungen von Hahnenwasser und Mineralwasser, in: Gas Wasser Abwasser GWA, 03/2006, S. 215-219.

- Lieback, J., Schumacher, S. (2010): Klimaschutz im Wasserglas, in UmweltMagazin, 9/2010, S. 62-63.