

Towards Green Batteries – LCA of Automotive Battery Systems

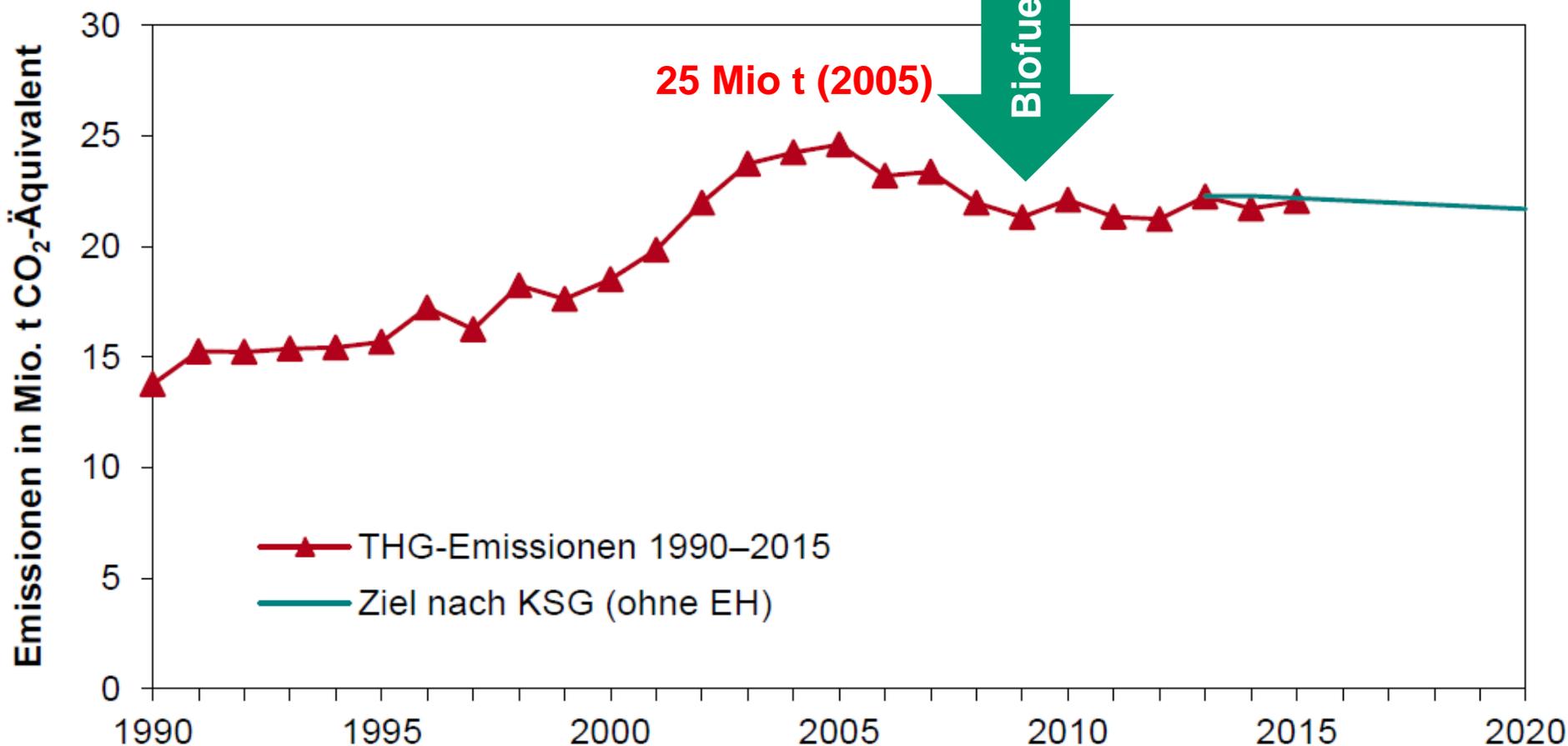


Gerfried Jungmeier

A3PS Conference 2018 “Future Propulsion Systems: Different
Regions - Different Strategies - Different Solutions

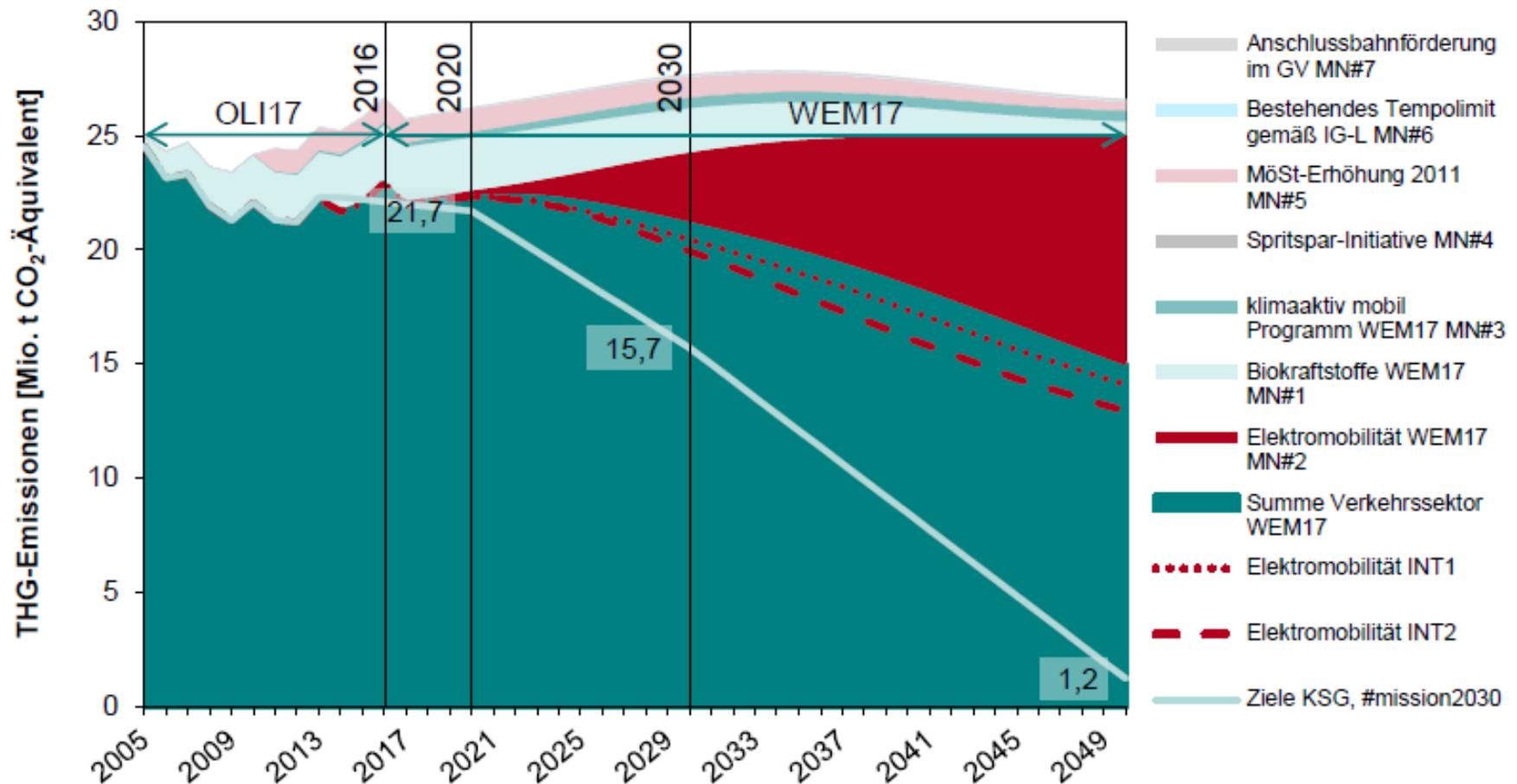
12 - 13 November 2018, Vienna, Austria

2 GHG Emissions of Austria Transport Sector



Future GHG Emissions of Austria Transport Sector

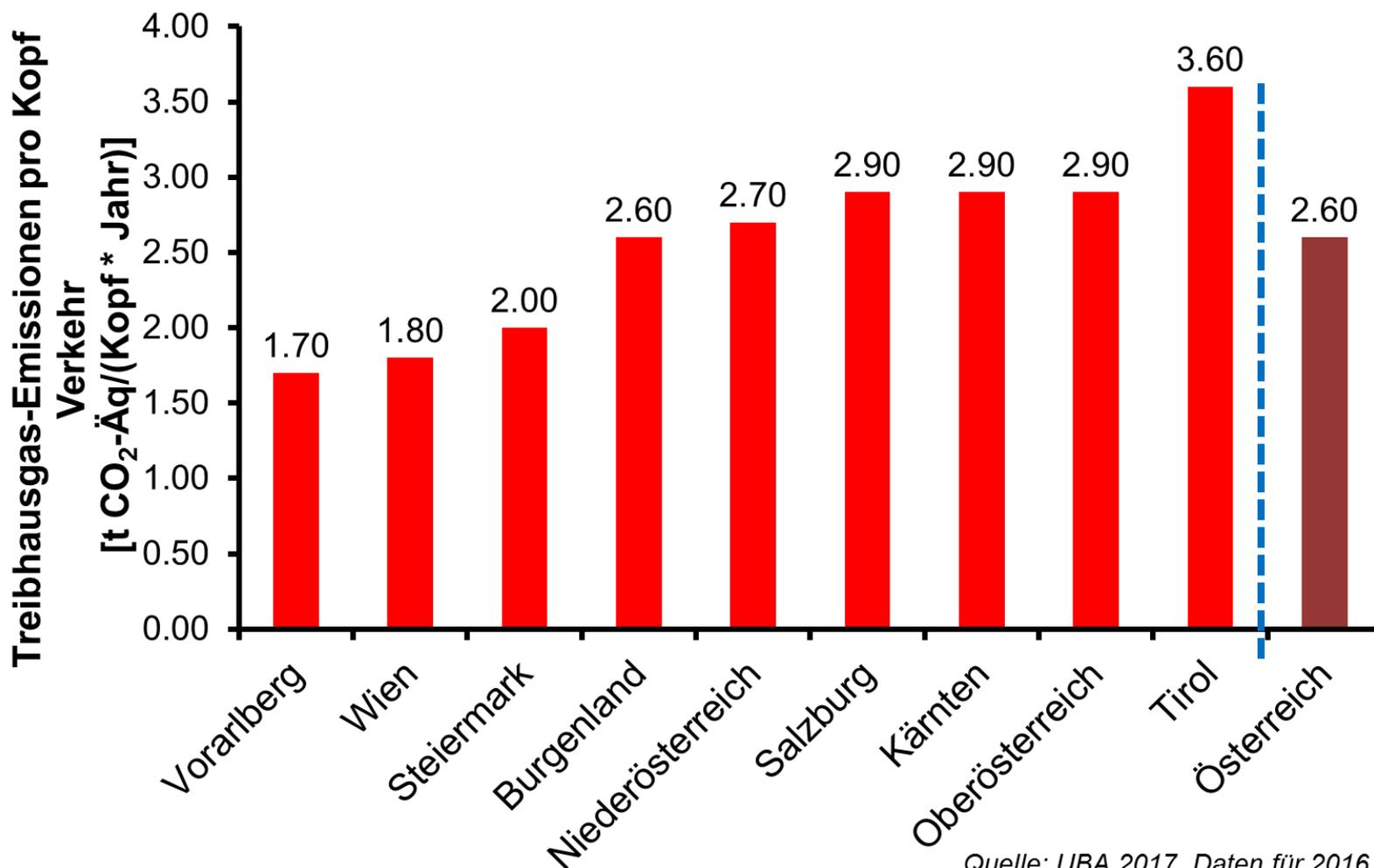
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Datenquellen: 2005–2016: Ergebnisse der Österreichischen Luftschadstoffinventur (OLI17)
2017–2050: WEM17

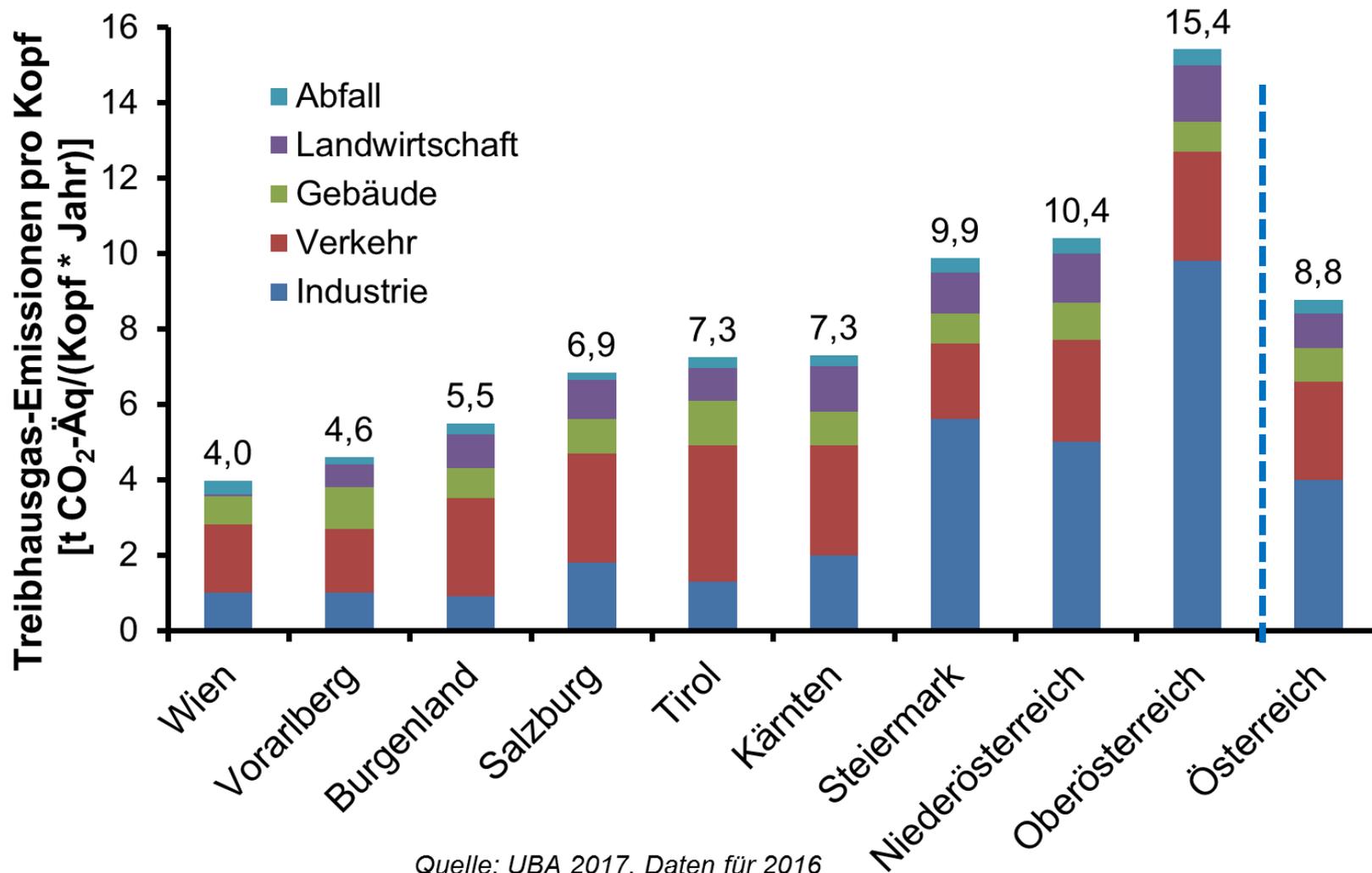
GHG Emissions per Capita in Austrian Transport Sector

4

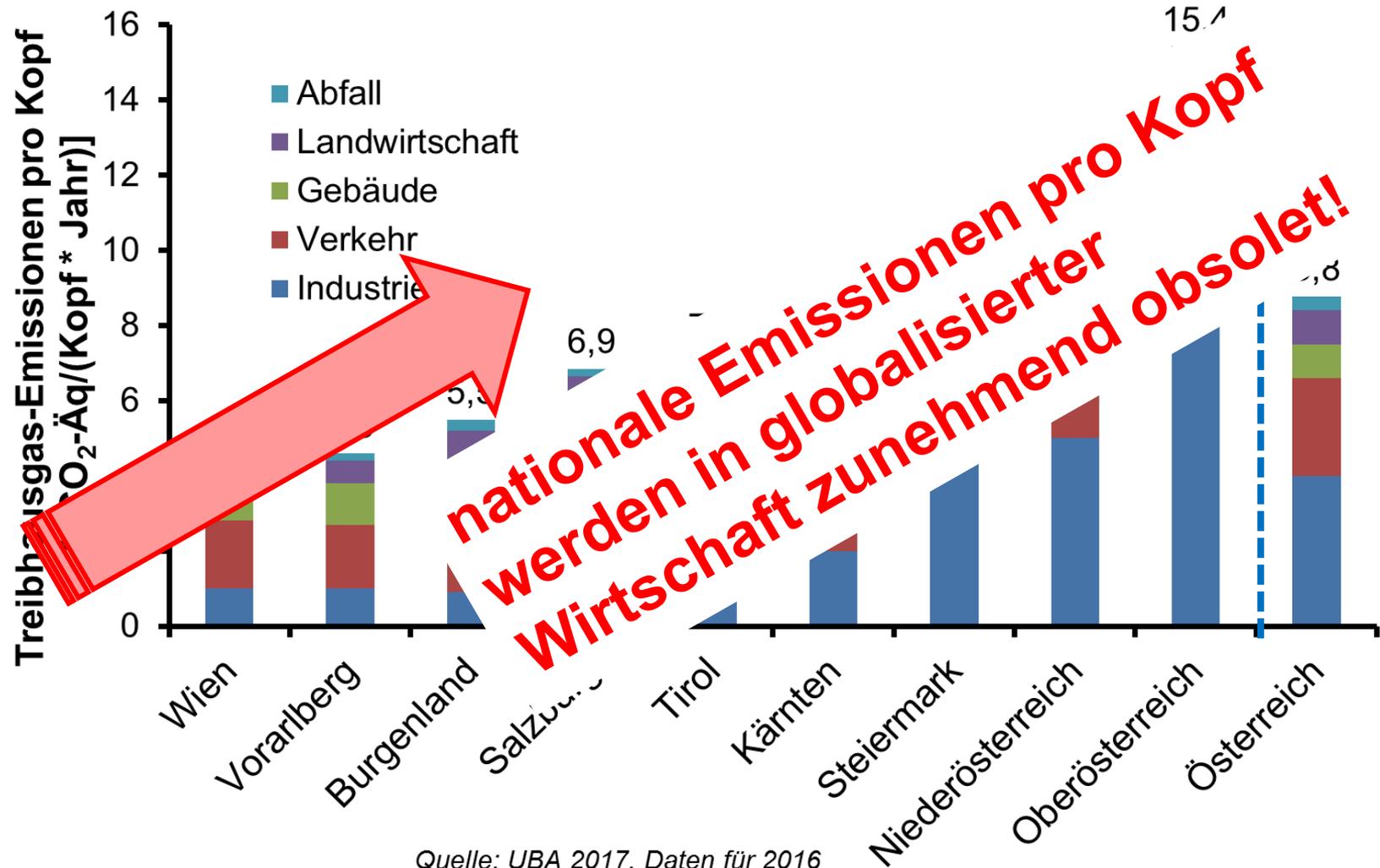


Quelle: UBA 2017, Daten für 2016

GHG Emissions per Capita in Austria

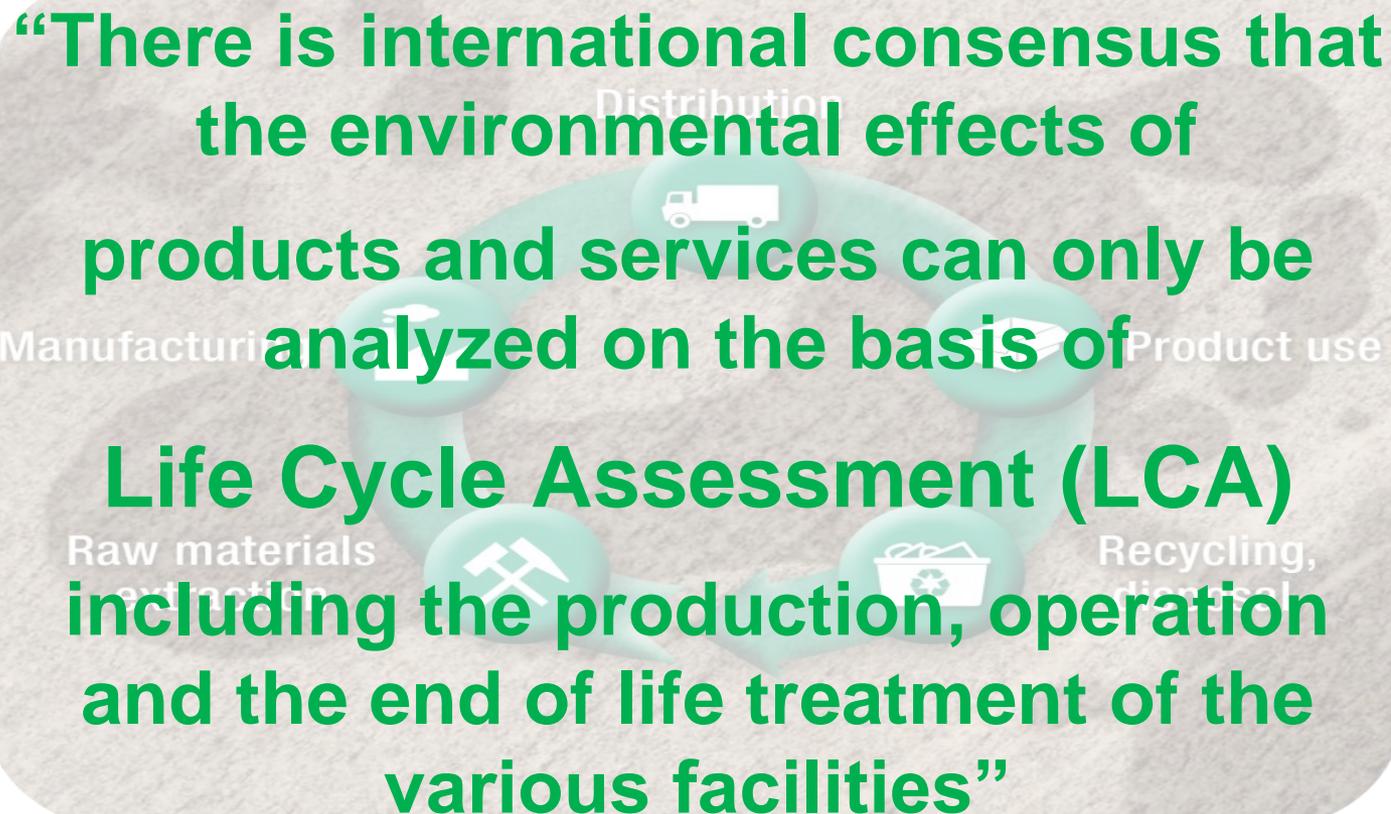


GHG Emissions per Capita in Austria



Statement on the Methodology for An Environmental Assessment

“There is international consensus that the environmental effects of products and services can only be analyzed on the basis of Life Cycle Assessment (LCA) including the production, operation and the end of life treatment of the various facilities”



LCA-Thinking Already Reached Policy Makers

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Austrian
Presidency
of the
Council of the
European Union



Federal Ministry
Republic of Austria
Sustainability and Tourism



Federal Ministry
Republic of Austria
Transport, Innovation
and Technology

Informal meeting of environment and transport ministers
29 to 30 October 2018, Graz

Graz Declaration

"Starting a new era: clean, safe and affordable mobility for Europe"

Clean vehicles: rapid introduction of zero-emission vehicles and decarbonised fuel options

Pursuing research and innovation efforts through the relevant current and future EU funding mechanisms, focusing on innovative technologies for the decarbonisation of the transport sector, including research on batteries, and complying with the principle of technology neutrality while taking into account **life cycle analysis** and well-to-wheel approaches.

Carbon Footprint of 10 € Purchase in Supermarket

9

10 €



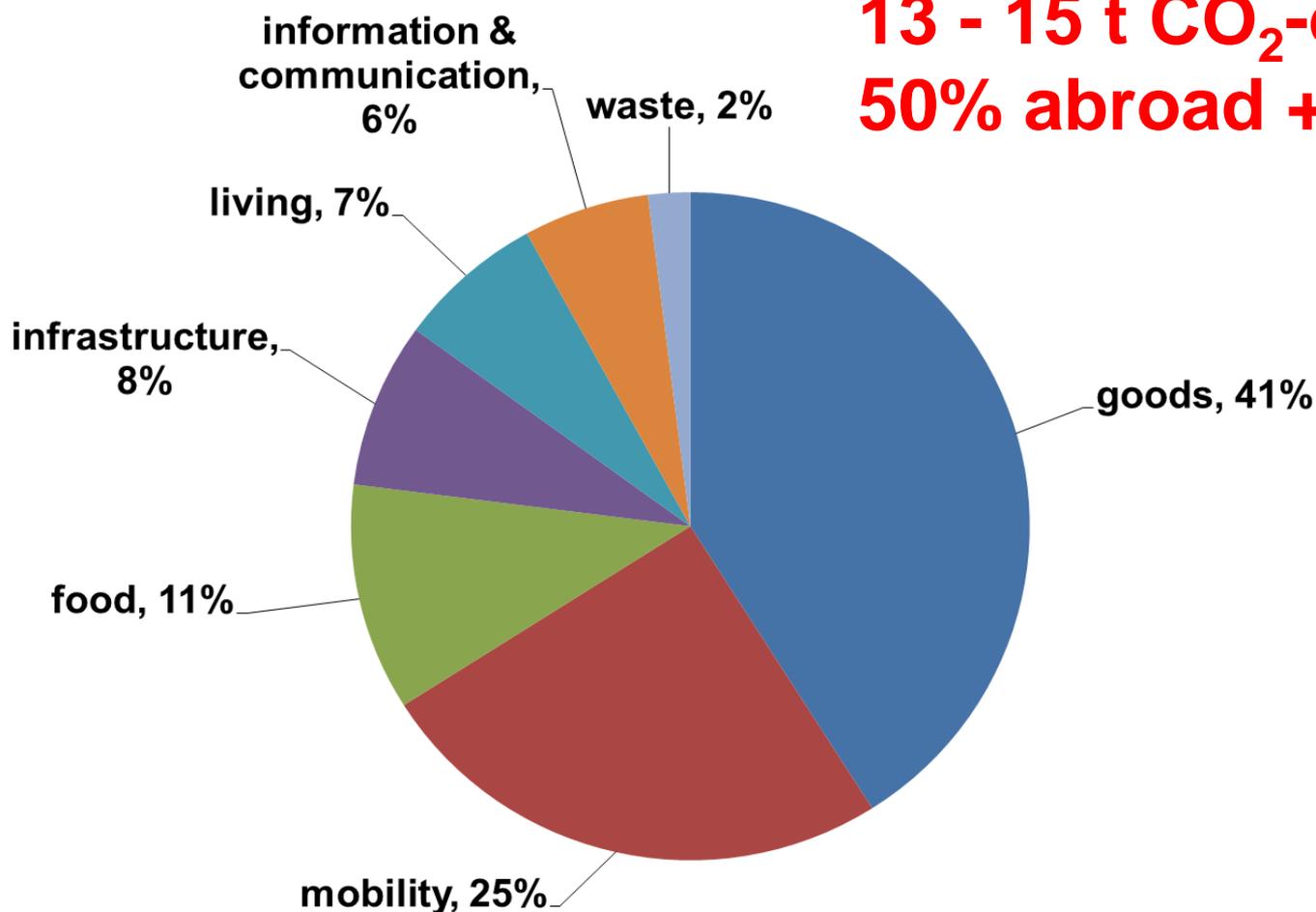
20 PKW-km

4 kg CO₂-eq.

Consumption Based Greenhouse Gas Emissions of the Austrians

10

13 - 15 t CO₂-eq/(cap * a)
50% abroad + 50% Austria



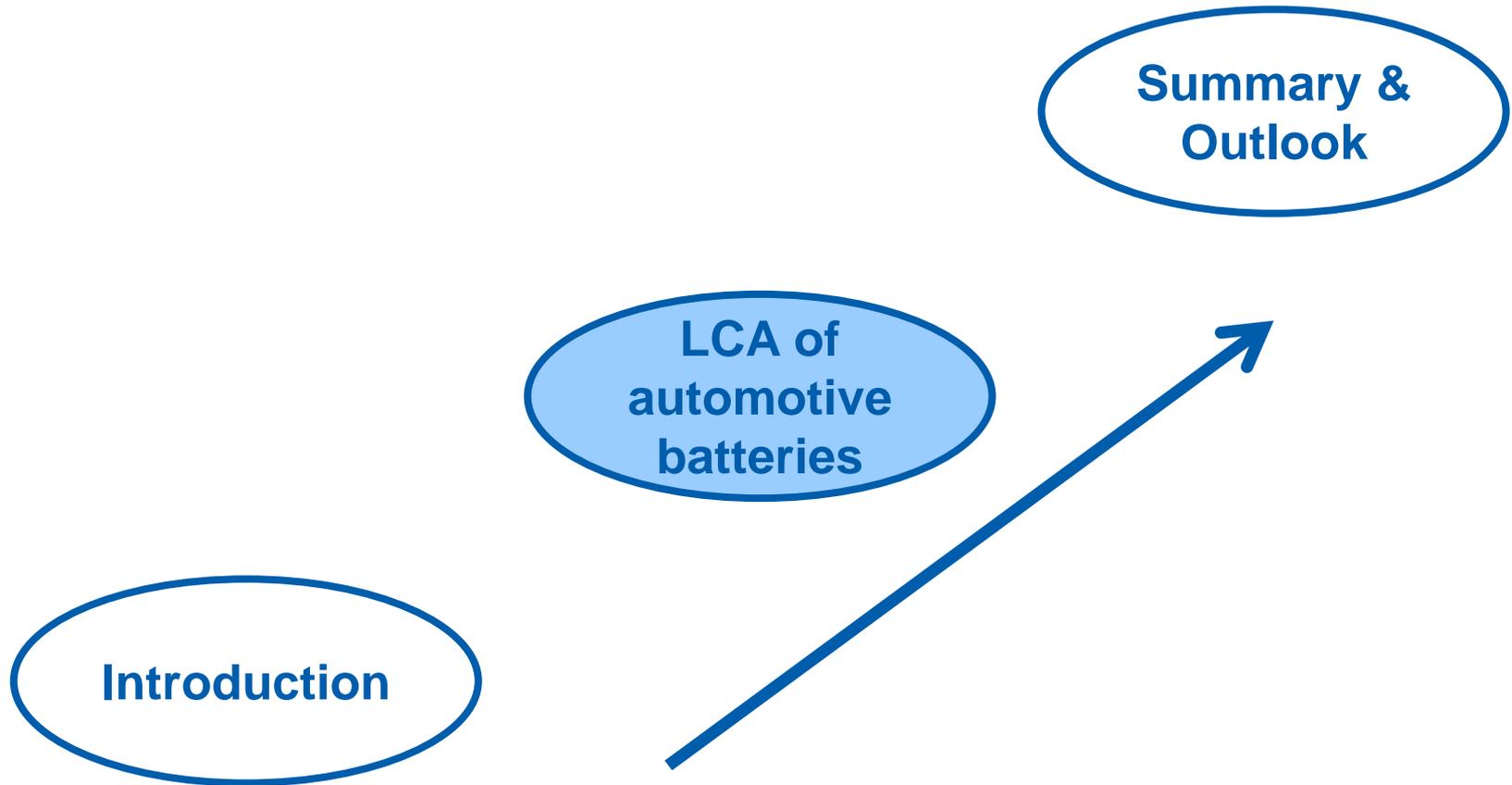
Towards Climate Friendly Lifestyles

Low Carbon Lifestyle = „Paris-Lifestyle“

**The „Paris Lifestyle“
is an innovative and satisfying „Low Carbon
Lifestyle“ characterized by having very low
greenhouse gas emissions contributing to the Paris
Agreement of limiting global warming to below
2° C.**

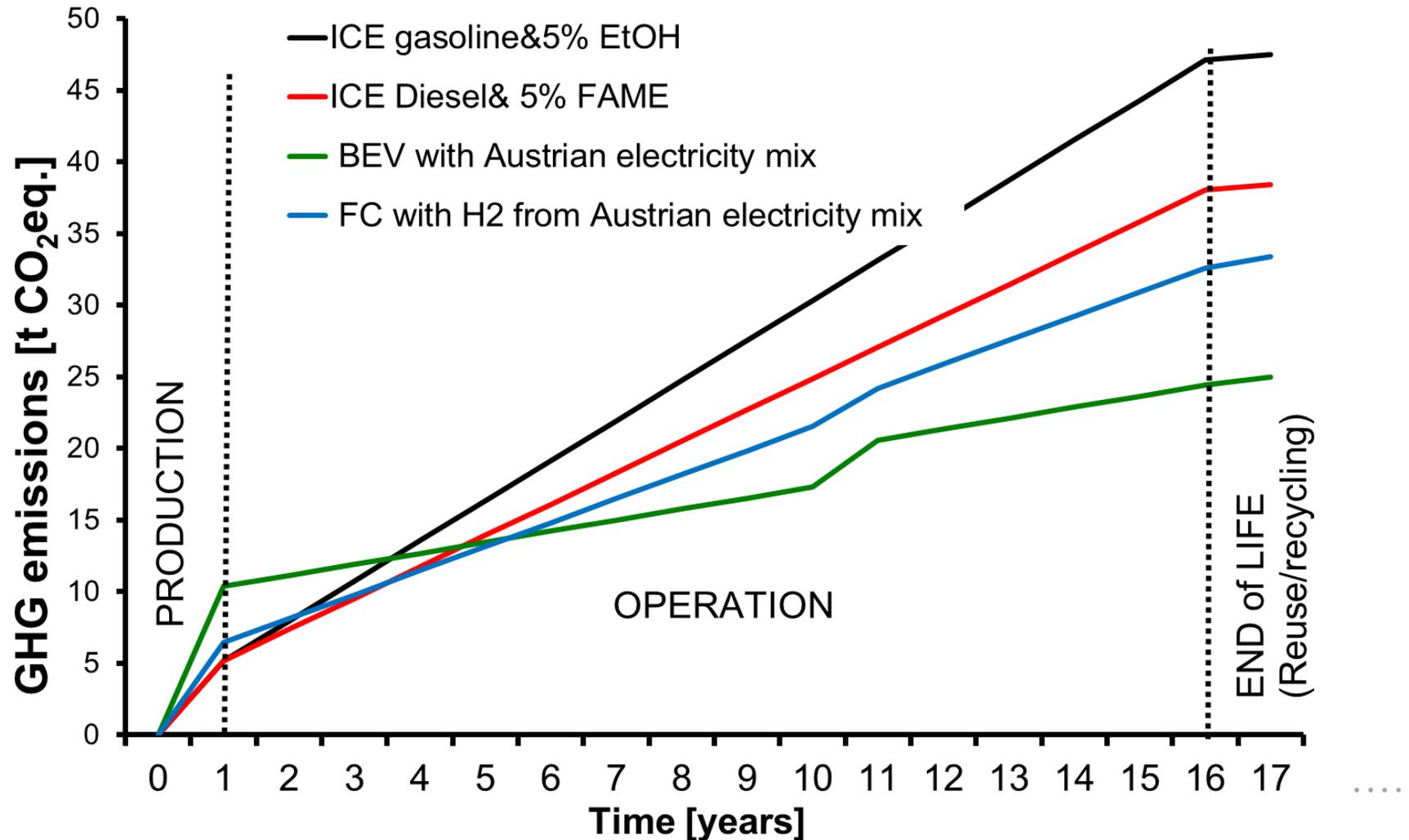
**The Paris Lifestyle creates new economic
opportunities and challenges by stimulating an
increasing demand for low Carbon products and
services.**

Overview



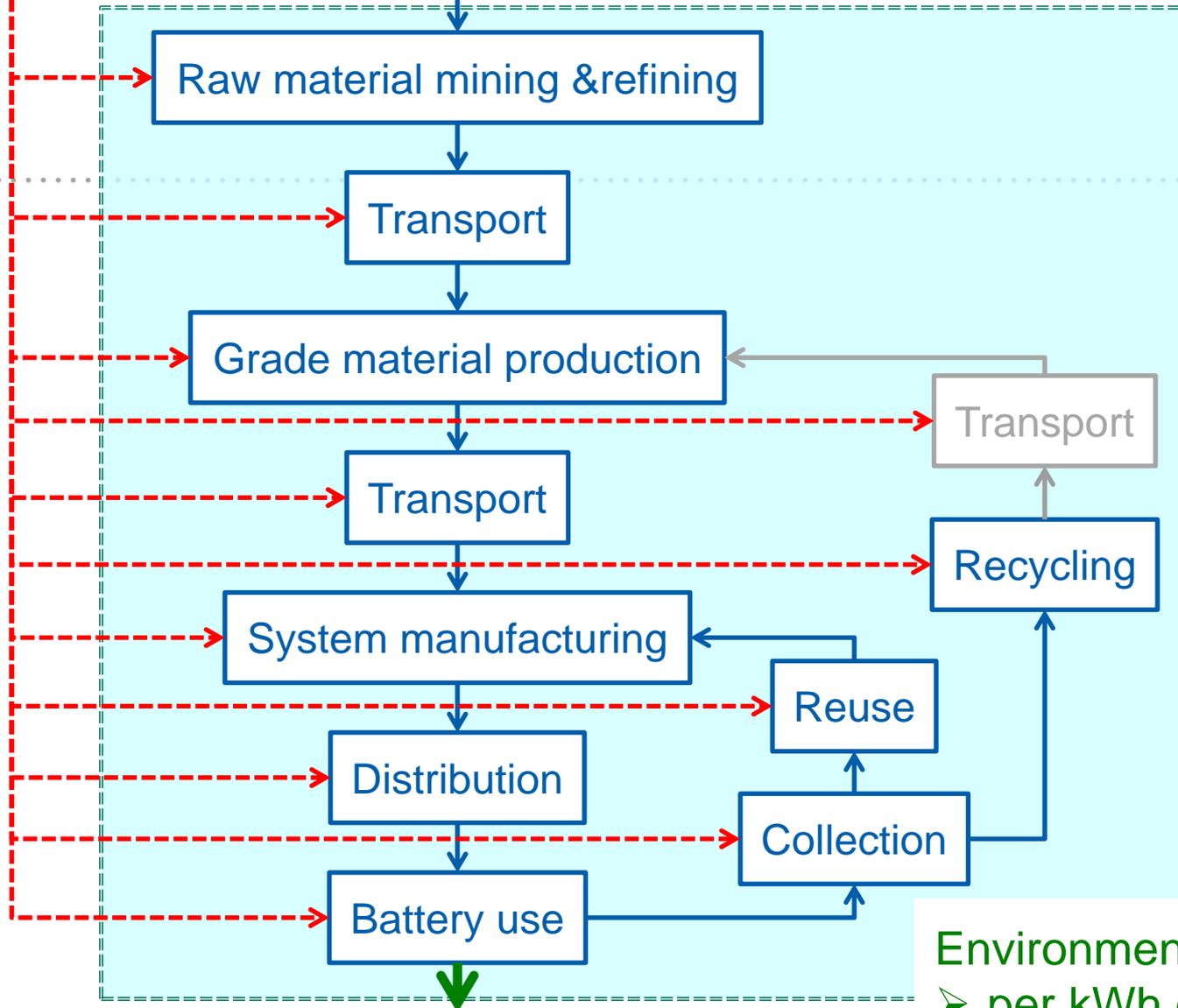
Cumulated GHG Emissions of Passenger Vehicles with Different Fuels

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Energy Resources

Material Resources



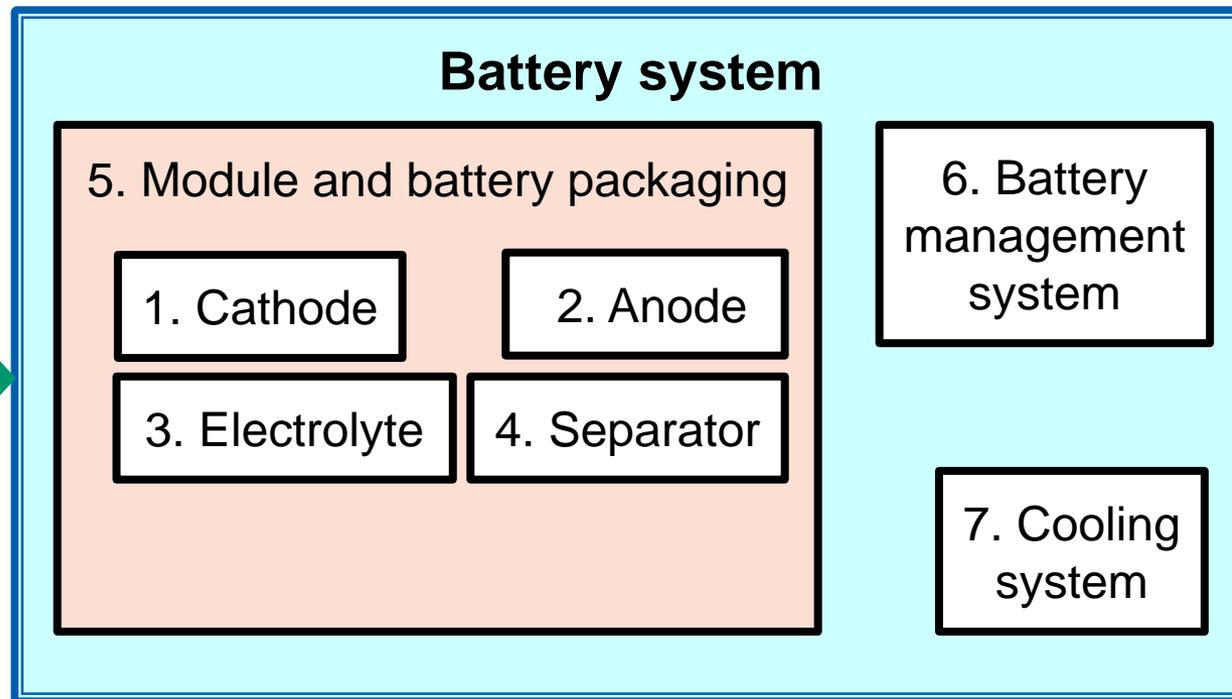
**LCA Modelling
System boundaries**

Environmental effects per
 ➤ per kWh capacity
 ➤ per driven kilometre

Battery service

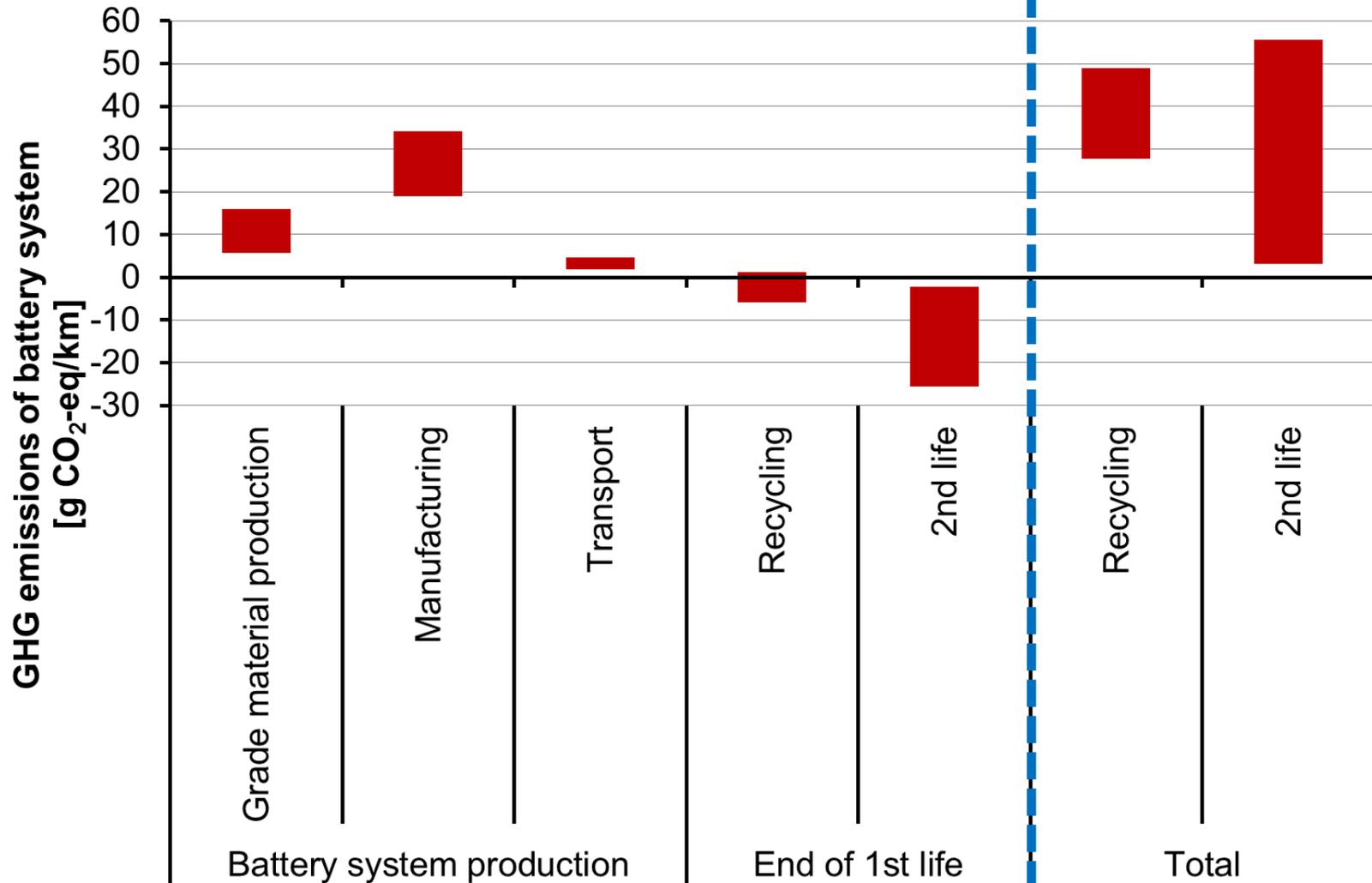
LCA Modelling: 7 Main Moduls of Battery System

15



Ranges of GHG Emissions from Battery System per km

16



Key Influences on Environment

■ Quantified influences

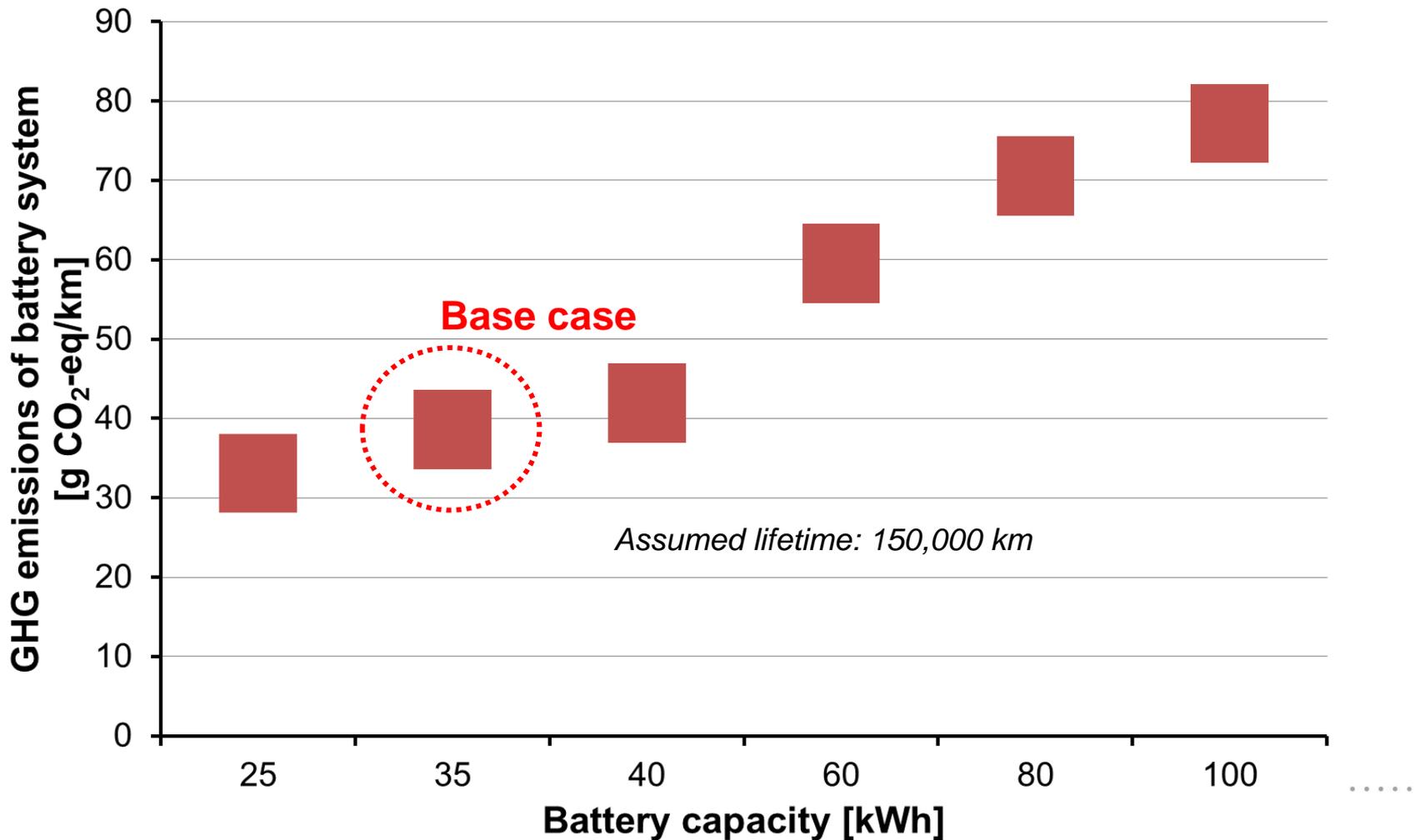
- Battery capacity
- Lifetime of battery
- Energy density
- Electricity mix of location for battery system manufacturing

■ Unquantified influences

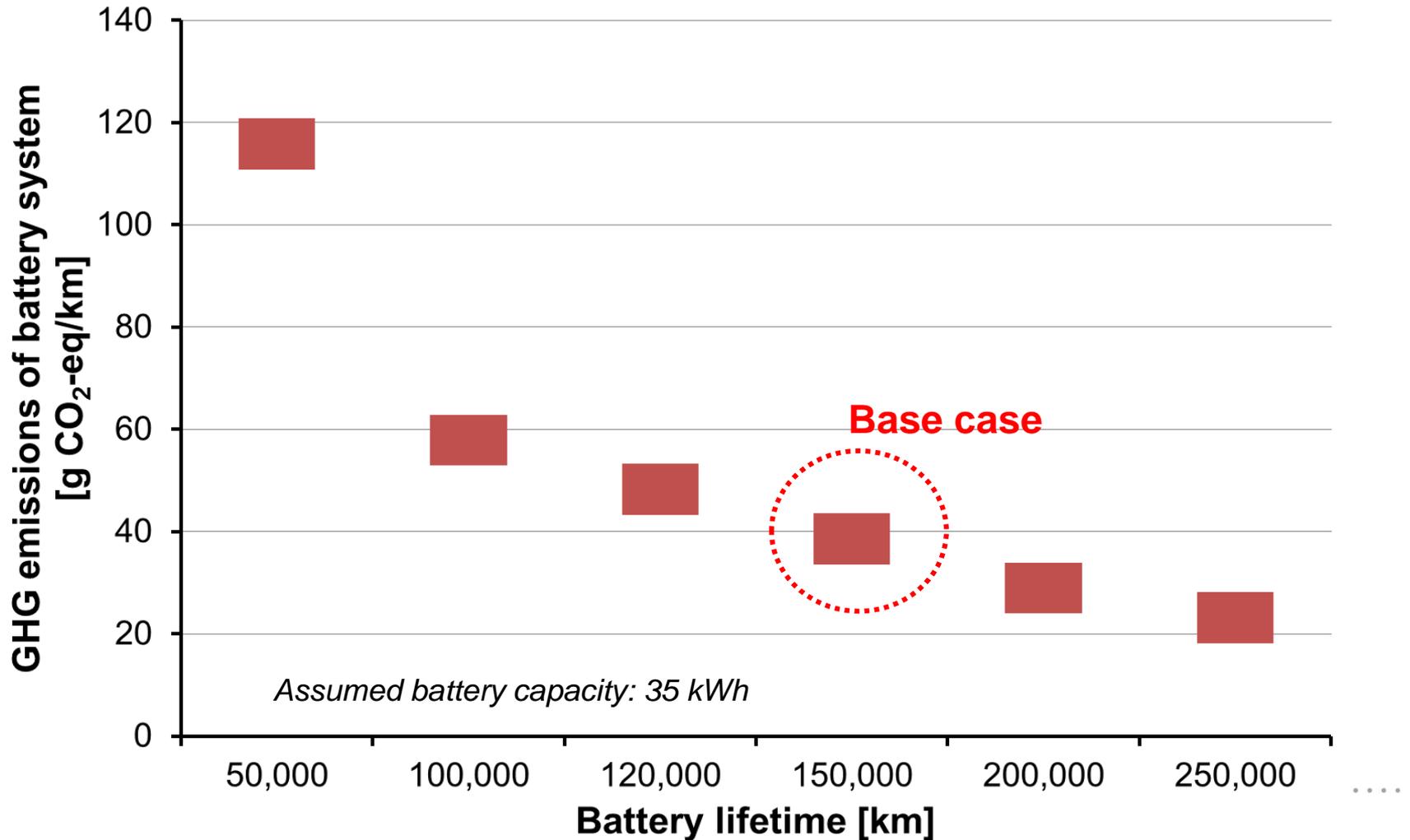
- Chemistry
- Material composition
- Grade material production
- Reuse: realistic data
- Upscaling/downscaling battery size

Influence 1: Battery Capacity

18

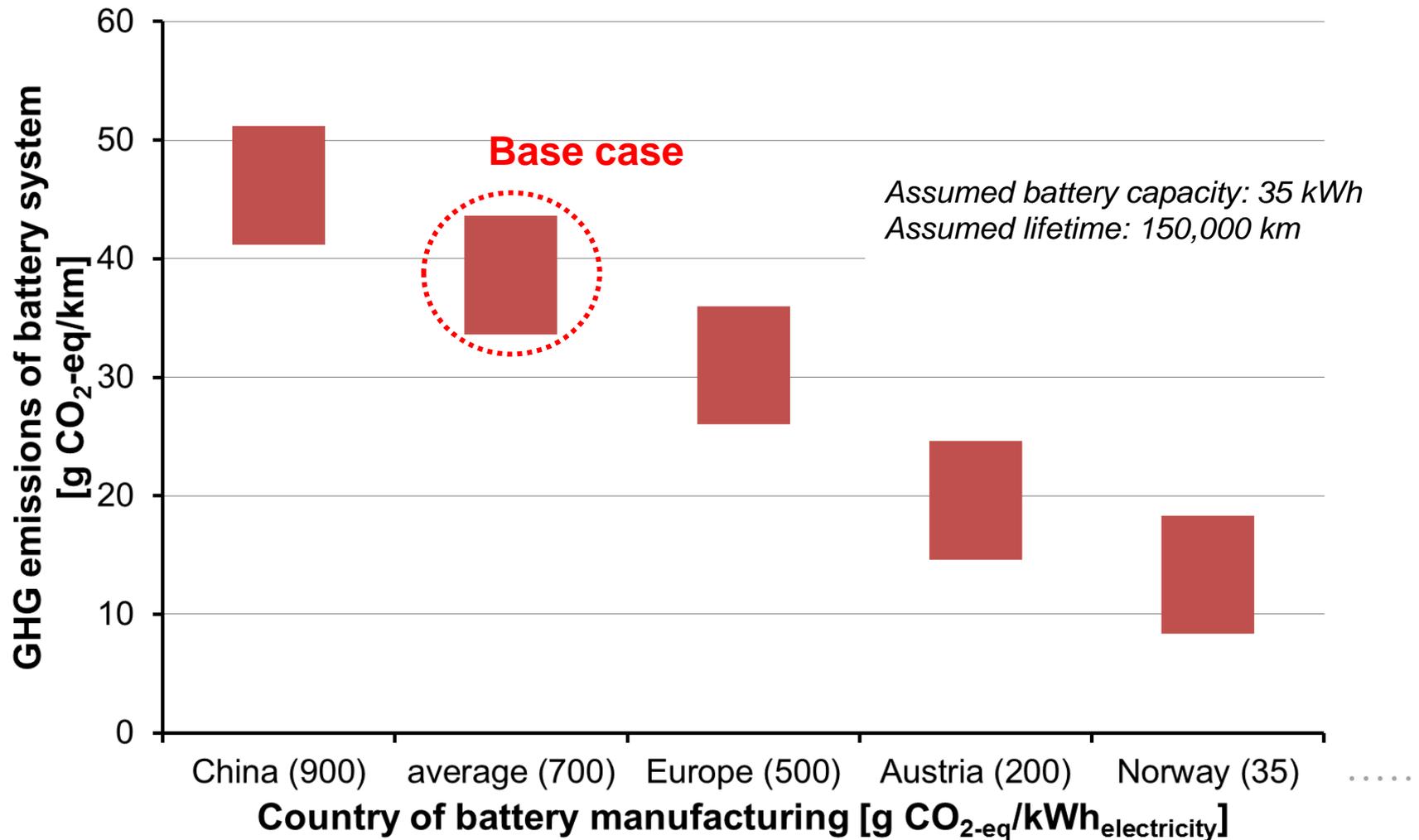


Influence 2: Lifetime

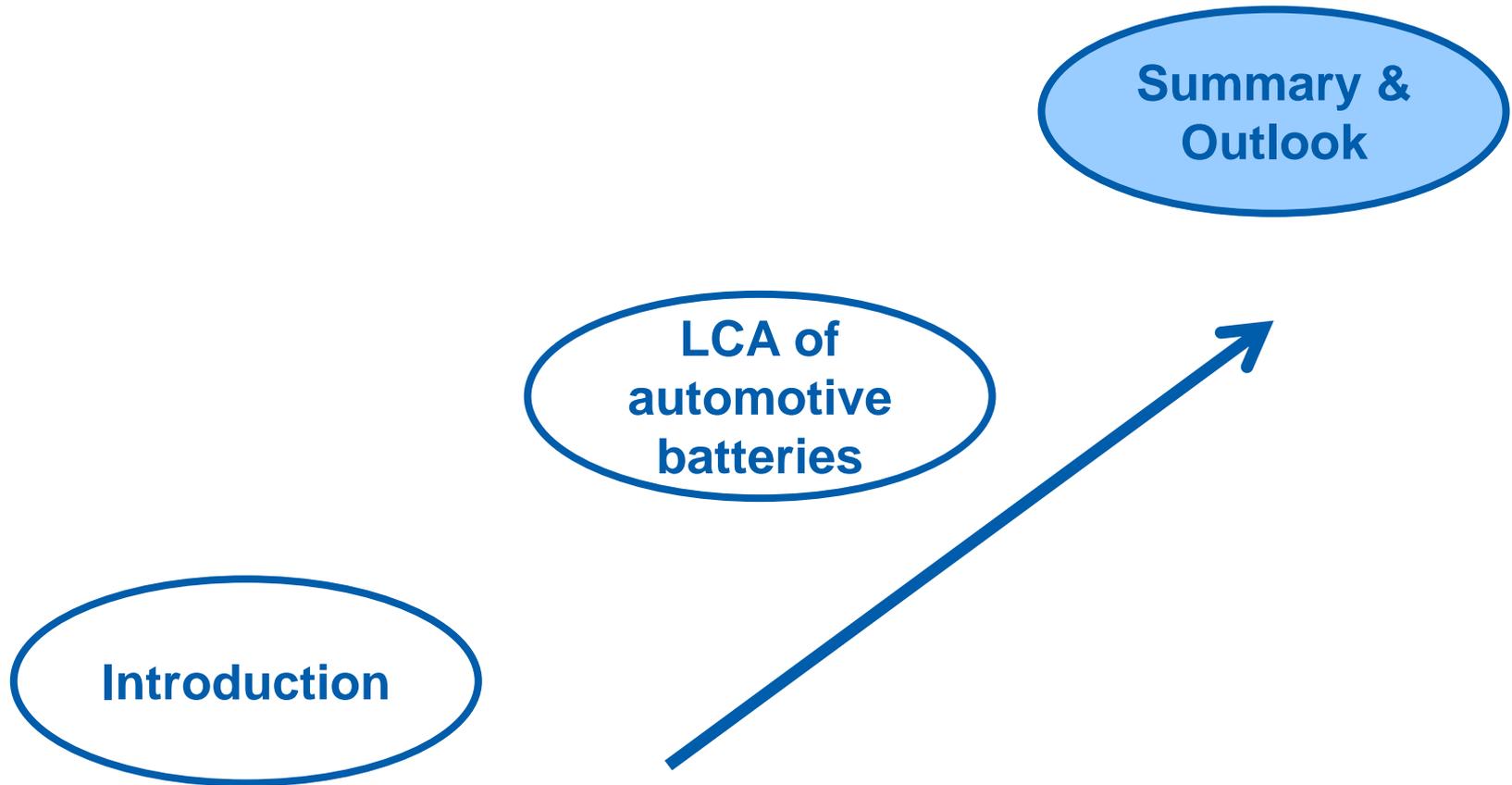


Influence 3: Country of Battery Manufacturing

20



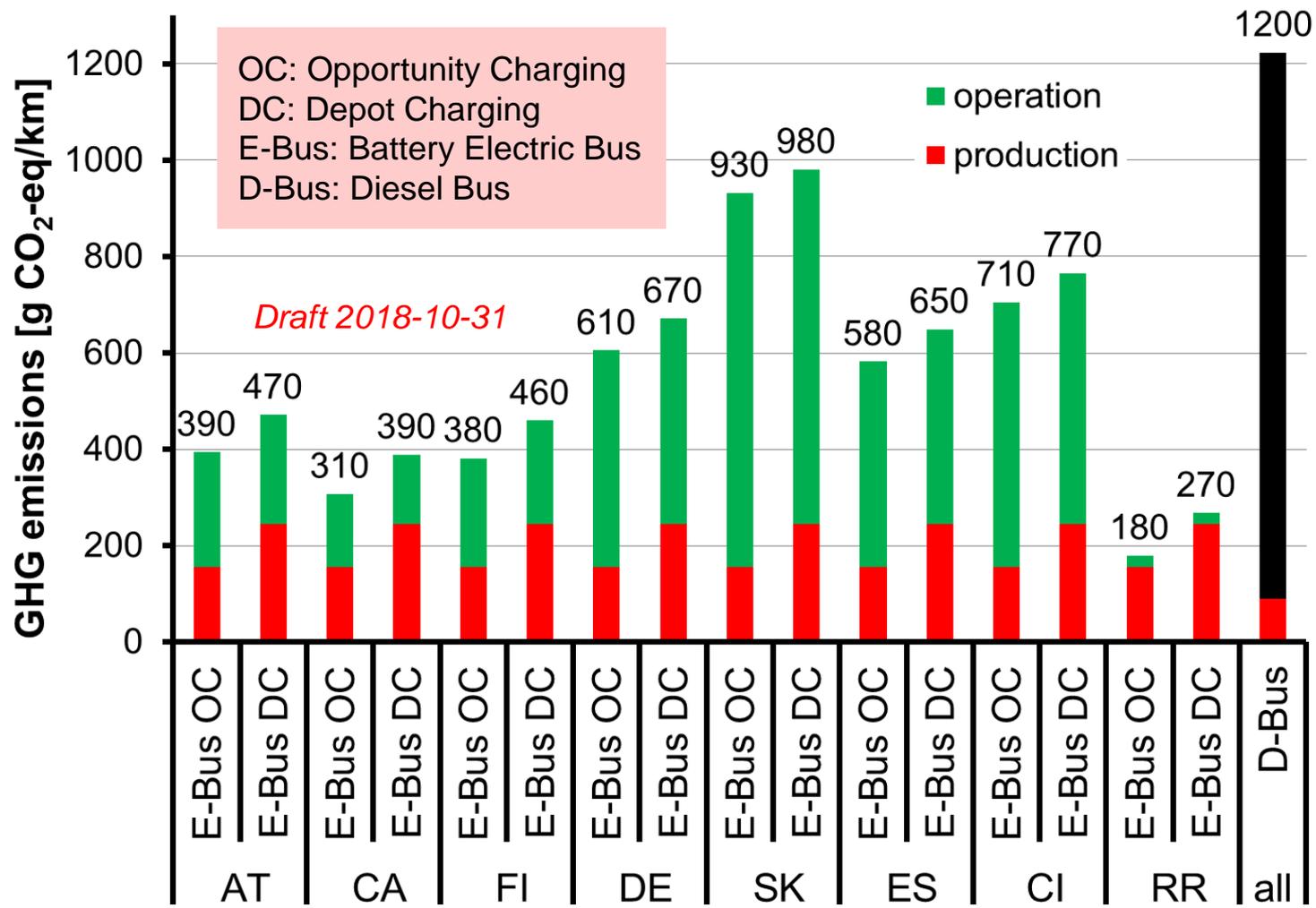
Overview



Battery Electric Bus

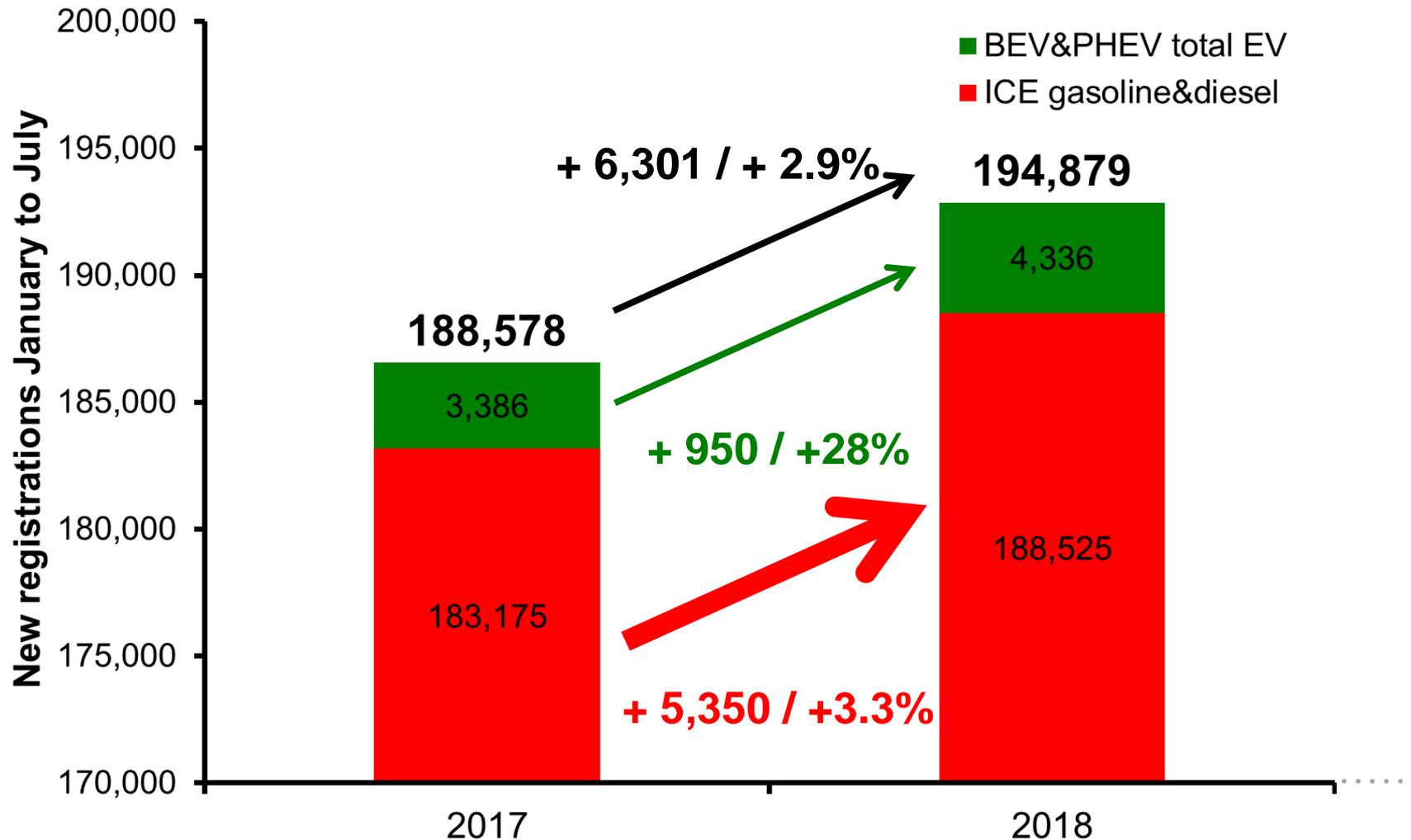
Compared to Diesel Bus in 8 Countries

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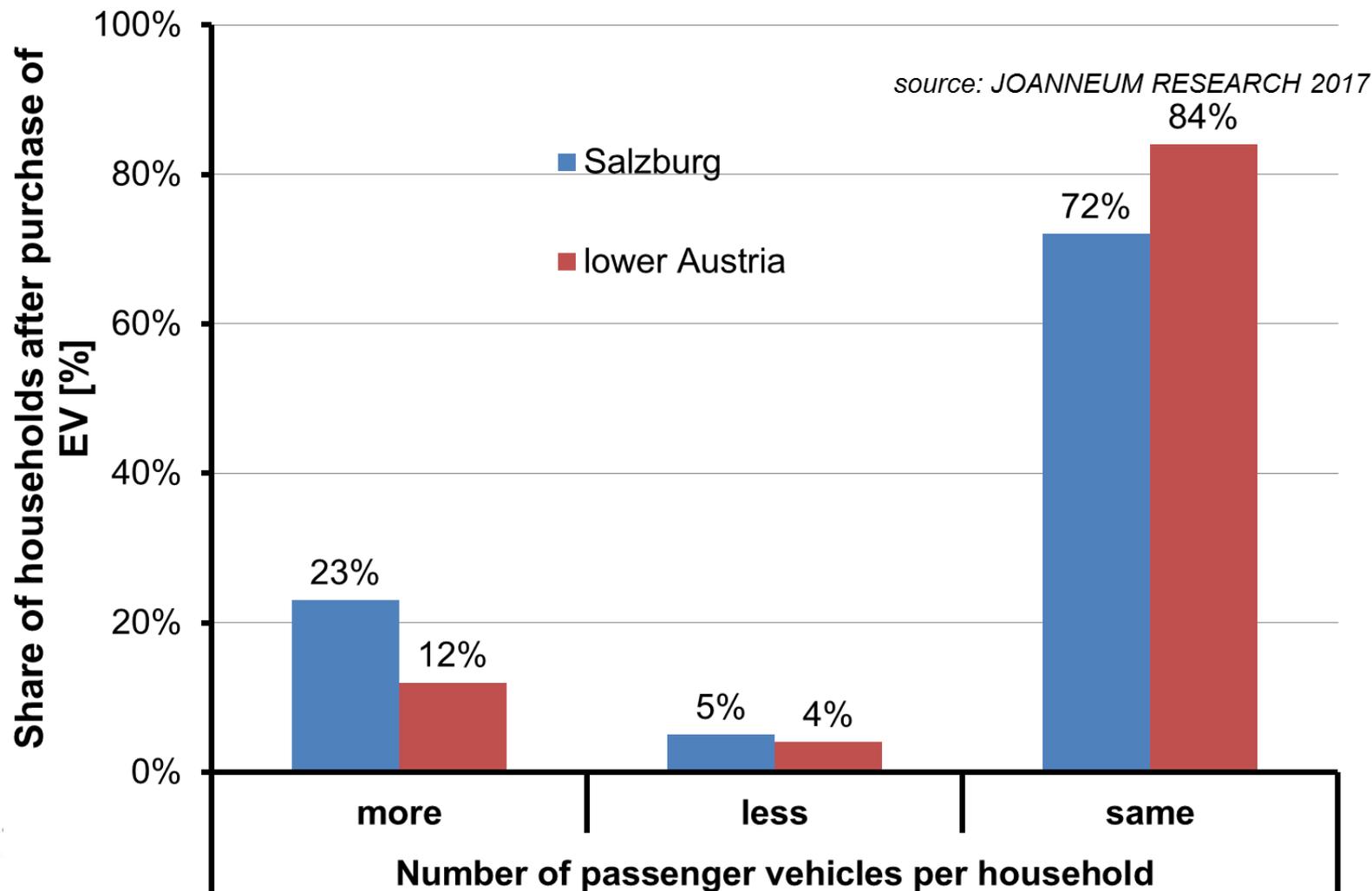
Ongoing activity in IEA HEV Task 33 „Battery Electric Buses“

Increasing Passenger Car Stock in Austria



Electric Vehicle Increases Number of Vehicles per Household

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Conclusions

Innovative & satisfying Low-Carbon Lifestyle = „**Paris Lifestyle**©“, fulfilling Paris-Agreement ($< 2^{\circ} \text{ C}$)

Mobility play with 25% significant role in consumption based GHG emissions, E-Mobility can be part of solution

Towards green batteries: **renewable electricity** in battery manufacturing, reasonable **battery capacity, lifetime, recycling**

BUT: in future **high volume production** of innovative high-efficient automotive batteries much lower impacts expected

Current production of automotive batteries **substantially contribute to GHG emissions** and primary energy demand in LCA of EVs

Environmental effects of automotive batteries can only be assessed based on **Life Cycle Assessment (LCA)**

Your Contact



www.paris-lifestyle.eu
www.paris-lebensstil.at

**JOANNEUM RESEARCH
Forschungsgesellschaft mbH
LIFE – Centre for Climate,
Energy and Society
Gerfried Jungmeier**

Elisabethstrasse 18, 8010 Graz
+43 316 876-1313
gerfried.jungmeier@joanneum.at

www.joanneum.at