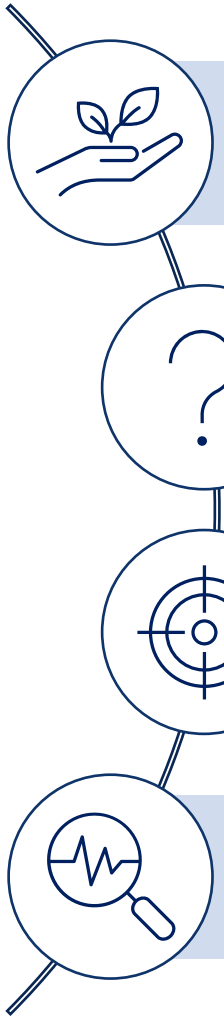
OXFORD ECONOMICS

THE ENVIRONMENTAL IMPACT OF DIGITAL & CASH PAYMENTS IN EUROPE

Results from a research project

13/05/2025

What is the environmental impact of digital vs. cash payments in Europe?



Cash payments produce 38% more GHG emissions than digital payments in the Netherlands according to previous studies*

What is the environmental impact of digital payments over cash payments in other European countries? What are the main drivers? How can the system's environmental footprint be minimised?

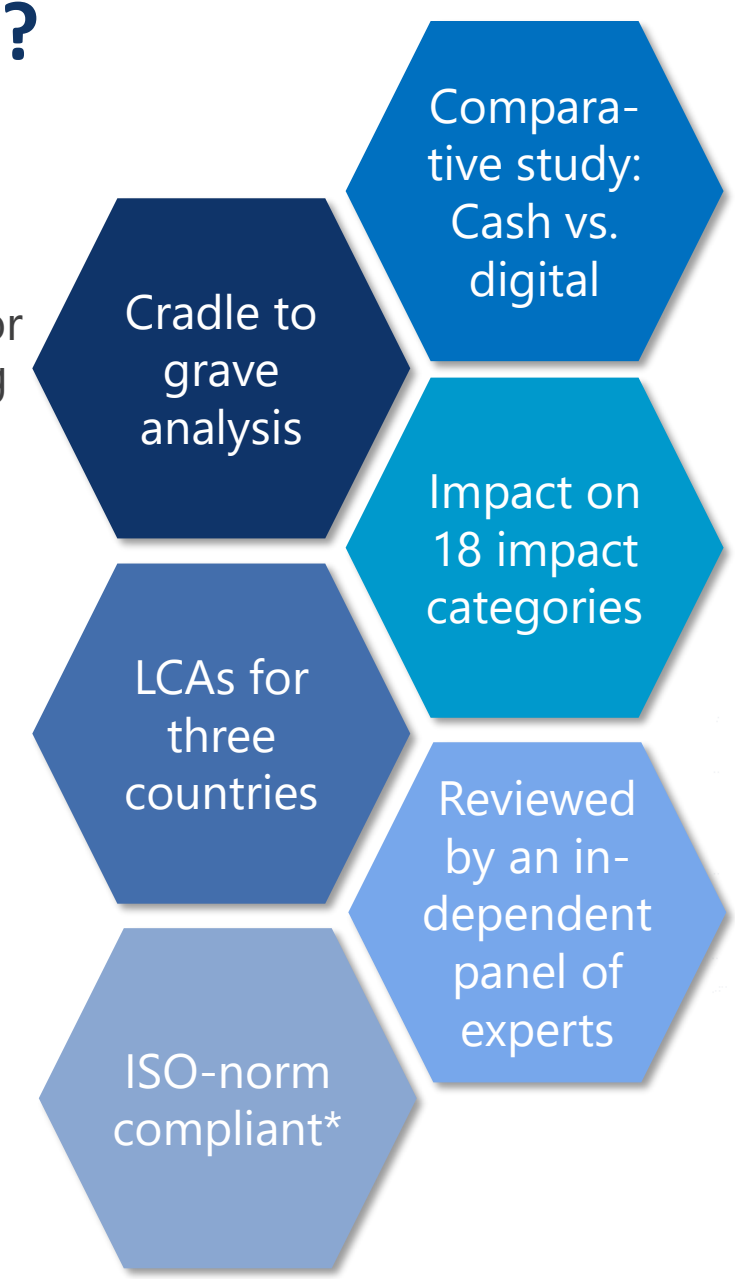
Gain quantitative insights into the environmental impact of digital over cash payments in Germany, Italy, and Finland

Perform a comparative LCA study investigating the environmental impact of the cash and the digital payment systems in the three countries

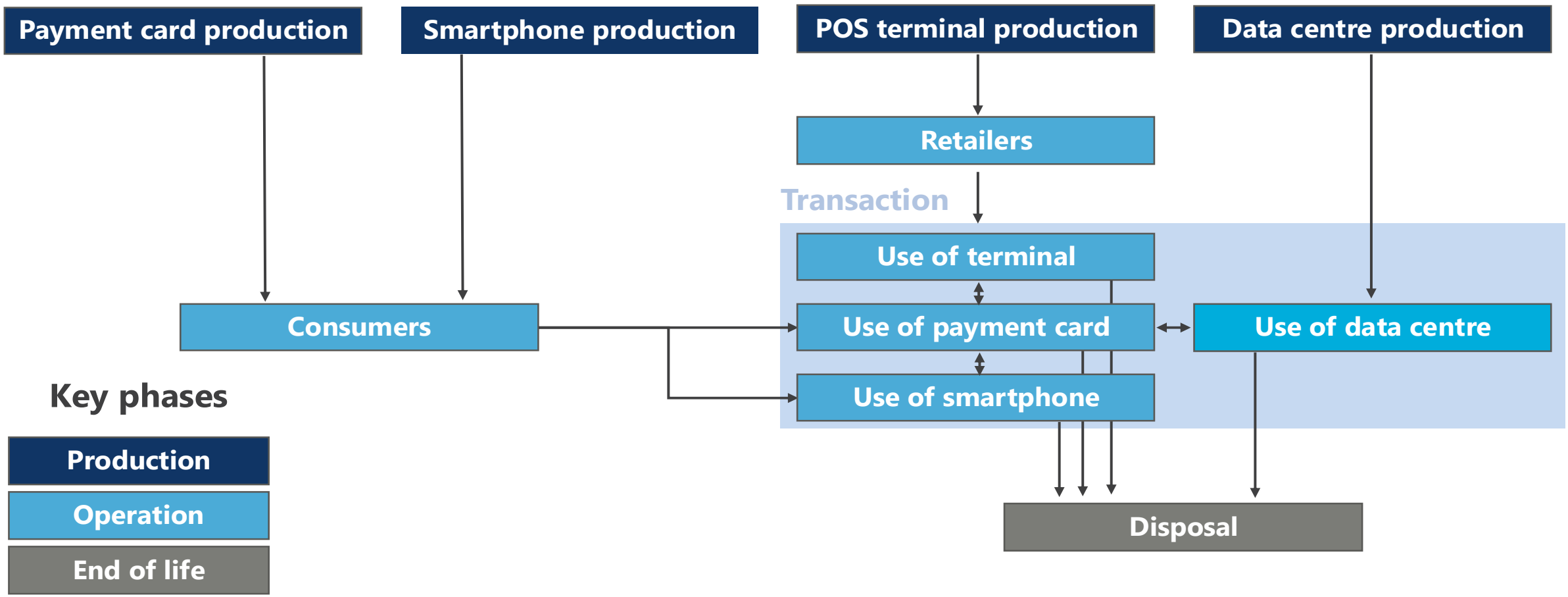
*See Hanegraaf et al. (2018) and Lindgreen at all (2017)

What do we actually study?

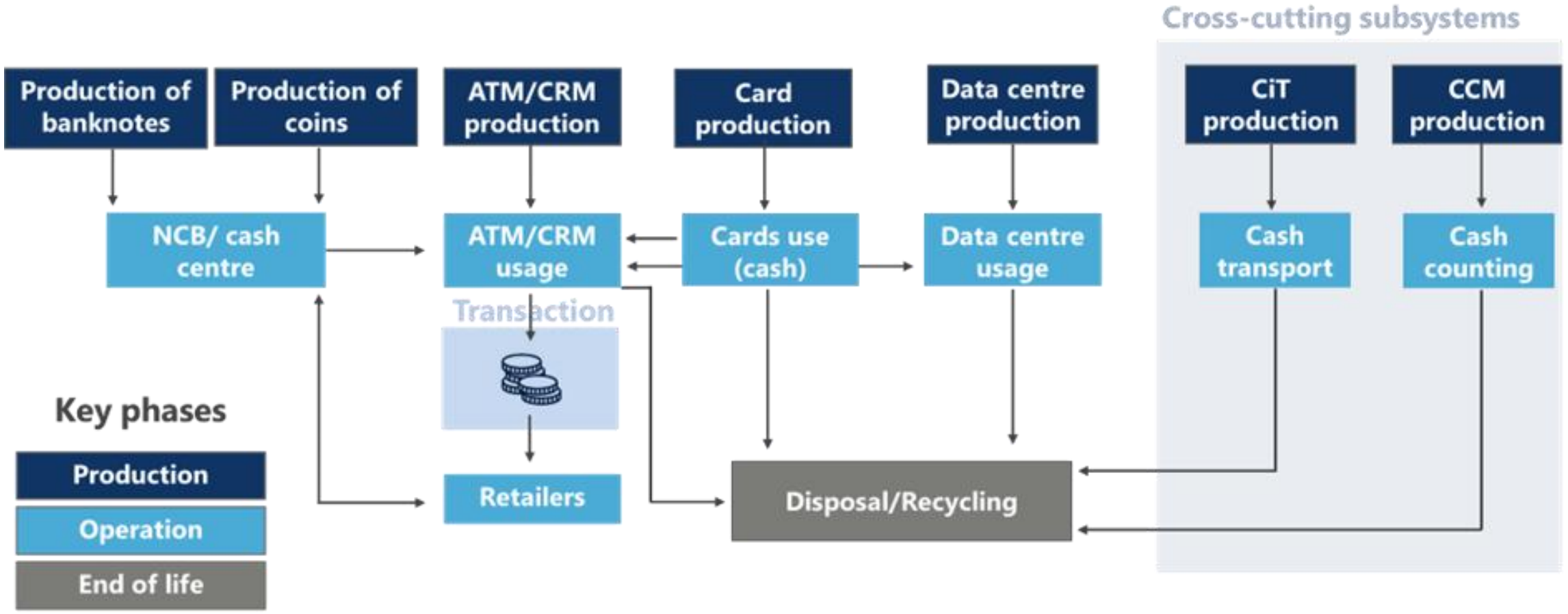
- LCA analysis
  - Holistic assessment of the environmental impacts of a product or service from cradle to grave including impacts to air, soil, water, and human health
  - Today, we focus only on global warming potential
- Function: pay for a good or service at a point of sales (POS)
- Functional unit: average payment transactions at POS in Italy, Germany, and Finland in 2022
  - Share of digital POS transactions: FI (81%), DE (37%), IT (31%)
- Data: Official statistics, literature, LCA databank (EcoInvent), primary data from market participants



How does the digital payment system look like?

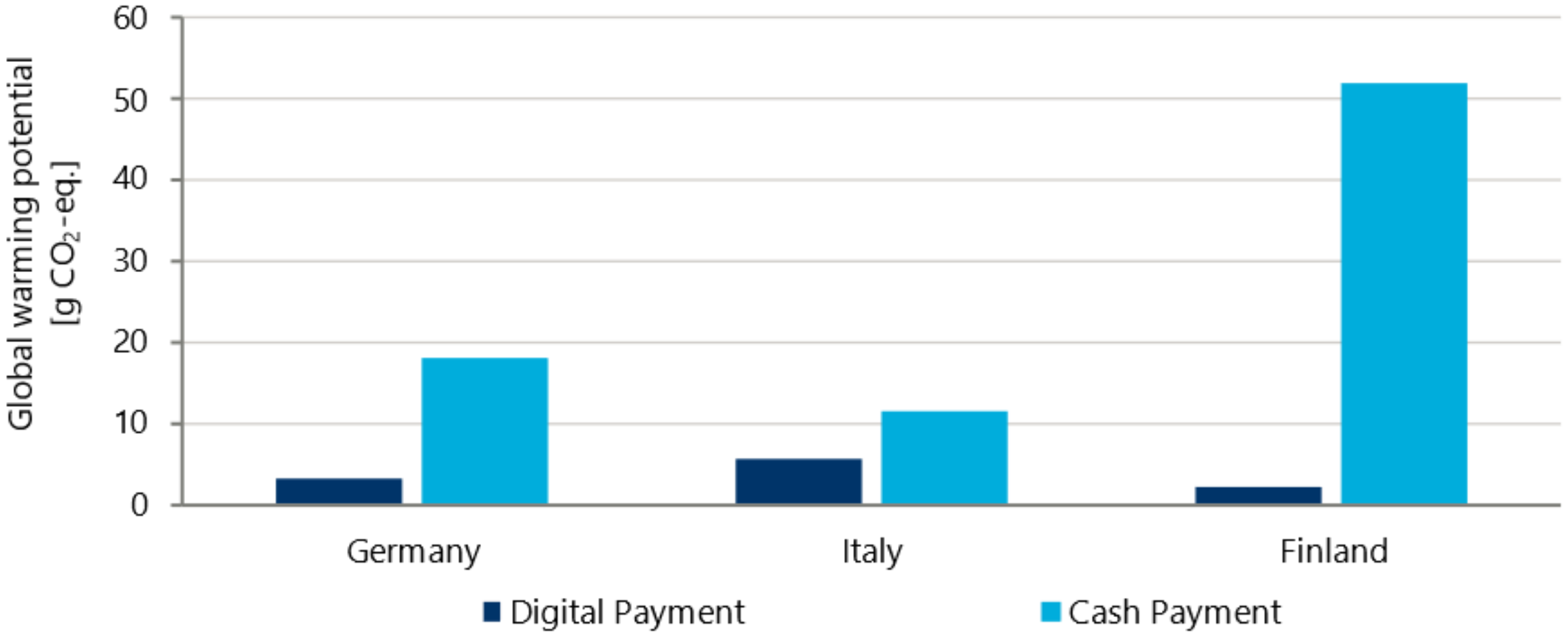


How does the cash payment system look like?

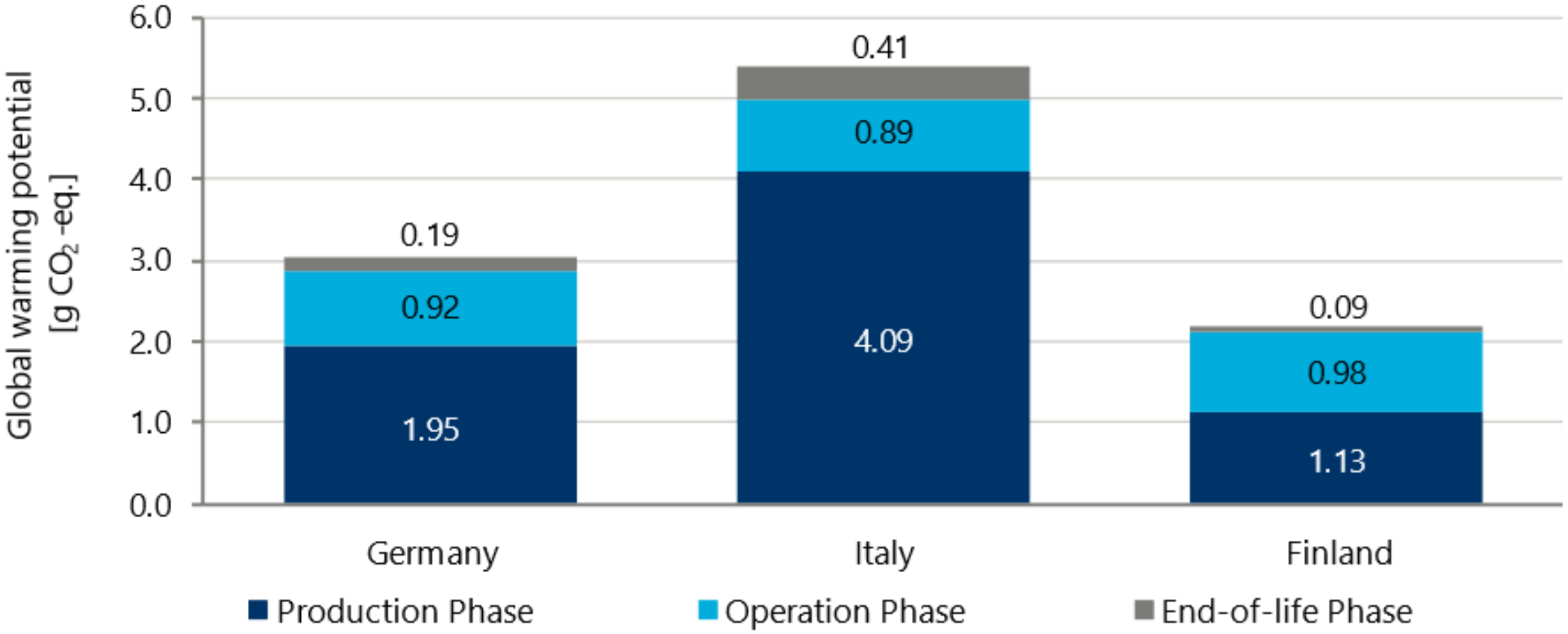


Note: 1) automated teller machine/ cash recycling machine; 2) cash-in-transit company; 3) cash counting machine

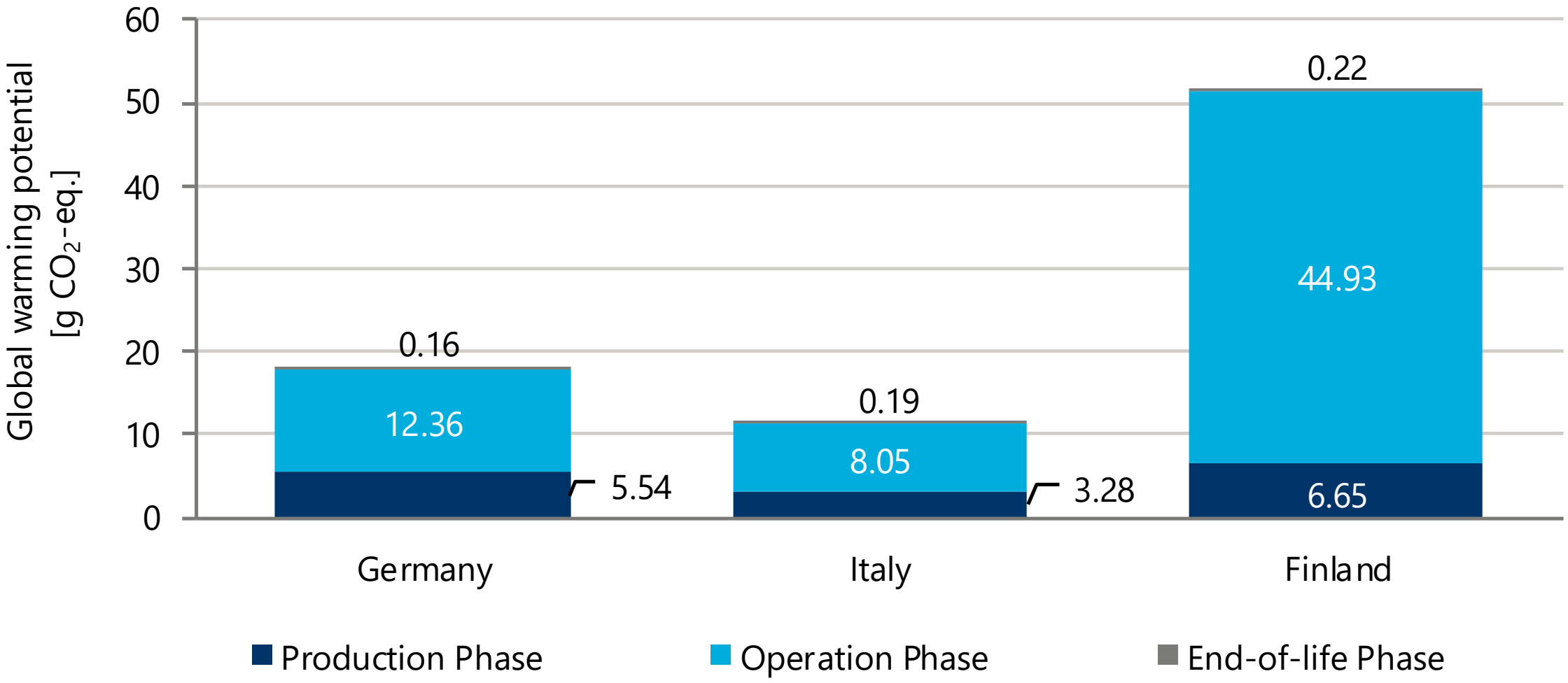
Comparative results – Global warming potential



Hotspot analysis – Global warming potential digital payment system by phase



Hotspot analysis – Global warming potential cash payment system by phase



What are the main findings and how can the environmental footprint of payments be reduced?

Main findings

In all analysed countries, digital payments have a significantly lower global warming potential than cash payments.	1
In 17 of 18 impact categories, digital payments have a significantly lower environmental impact than cash payments.	2
An average cash (digital) payment has least global warming potential in Italy (Finland) with the least (highest) digital payment adoption.	3
These results are robust to various alternative scenarios.	4

Recommendations

The highest potential to reduce the environmental impact of the digital payment system by the industry lies in the production phase. For the cash payment system, it lies in the operation phase.	5
The increased share of digital payments can have a positive effect on the climate. There remains a challenge to balance cash and digital payment infrastructure needs.	6

Contacts

EUROPE

Oxford (Headquarters)
Tel: +44 (0)1865 268 900

London
Tel: +44 (0)20 3910 8000

Belfast
Tel: + 44 2892 635400

Milan
Tel: +39 02 8295 2521

Frankfurt
Tel: +49 69 96 758 658

Paris
Tel: +33 (0)1 78 91 50 52

Stockholm
Tel: +46 (0) 8 446 887 65

AFRICA AND MIDDLE EAST

Cape Town
Tel: +27(0)21 863-6200

Dubai
Tel: +971 56 396 7998

AMERICAS

New York
Tel: +1 (646) 786 1879

Philadelphia
Tel: +1 (646) 786 1879

Mexico City
Tel: +52 155 5419-4173

Boston
Tel: +1 (617) 780 2265

Chicago
Tel: +1 (847) 993-3140

Los Angeles
Tel: +1 (424) 303 3449

Toronto
Tel: +1 (905) 361 6573

ASIA PACIFIC

Singapore
Tel: +65 6850 0110

Sydney
Tel: +61 (0)2 8458 4200

Hong Kong
Tel: +852 3974 8842

Tokyo
Tel: +81-(0)3-4588-2798

Sensitivity analysis

The results seem to be robust.

- Several sensitivity checks were performed
  1. No way to ATM/CRM (impact on cash payment system)
  2. Newer POS terminal model (impact on digital payment system)
  3. No refurbishment of terminals (impact on digital payment system)
  4. Worst EoL for refurbished terminals (impact on digital payment system)
  5. Printing of two paper receipts (impact on digital payment system)
  6. Higher energy use of digital data centres (impact on digital payment system)
  7. Higher energy use for cash data centres (impact on cash payment system)
  8. Lower energy use of digital data centres (impact on digital payment system)
  9. Data centres local grid (digital only) (impact on digital payment system)
  10. Data centres local grid (impact on cash and digital systems)
  11. More small CCMs (impact on cash payment system)
  12. No small CCMs (impact on cash payment system)
  13. Recycled cards (impact on cash and digital payment system)
  14. Double life of banknotes (impact on cash payment system)
  15. No overhead during coin production (impact on cash payment system)

In all scenarios, digital payments have a significantly lower global warming impact than cash.

Hotspot analysis – Global warming potential digital payment system by subsystem