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Is Electric Mobility a Means for more Sustainability? Observations on the Mobility and Charging Behavior from an On-Road Test with Electric Scooters

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Research Question

Electric Vehicles (EV) can be a contributor to reduce Greenhouse Gas Emissions, if …

… **EVs reduce the use of conventional vehicles** and do not replace sustainable ways of transportation (e. g. public transportation)

… **EVs are charged with electricity from renewable resources (RES)**

It is, however, challenging to investigate these aspects, because…

… **no observable sample** → only few German household own an EV

… **no incentives in place** that motivate to shift charging at times when RES-electricity is available

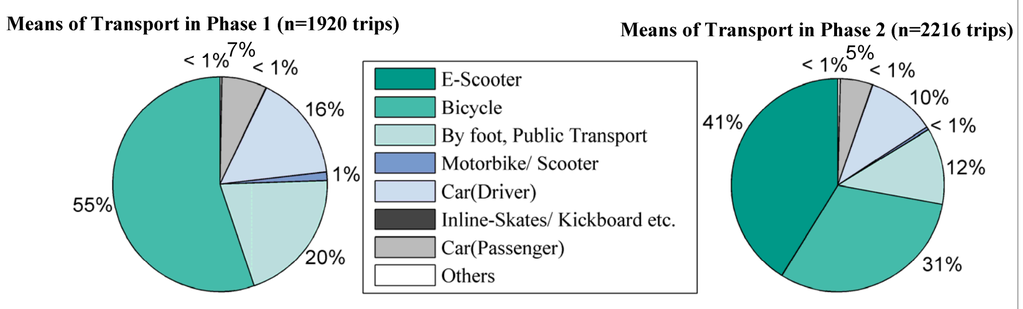
Study Set-Up

	1. Conventional	2. Electric Mobility		
A. 2012	▪ 5 weeks ▪ Mobility App (GPS-Data & additional info)	▪ 5 weeks ▪ Mobility App ▪ Electricity Meter ▪ E-Scooter	n = 10	N = 20 ▪15 male ▪5 female ▪22-25 yrs
B. 2013			n = 10	

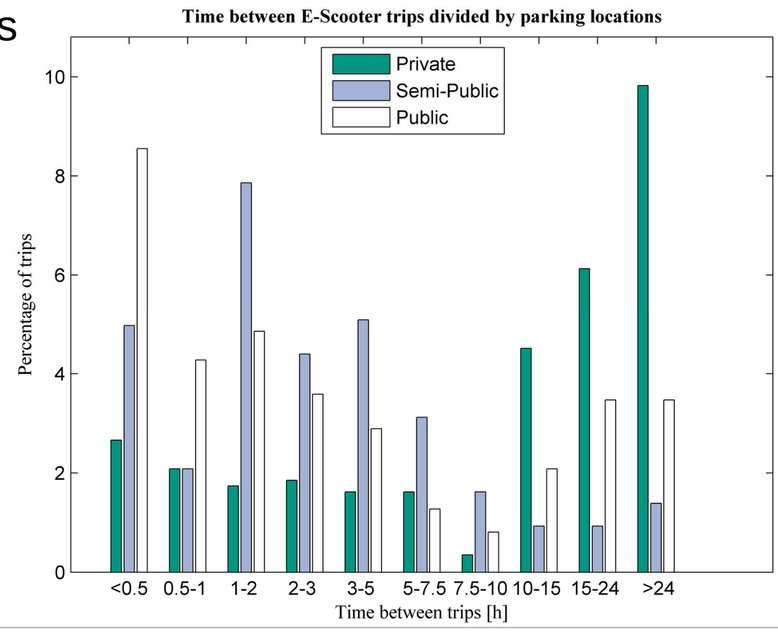
- **Two tests:** April – July 2012 (A) and 2013 (B)
- Each sample with 10 business-engineering students
- Tracking & analysis in **two phases**: conventional (1) and electric (2) mobility behavior
- Additional data from a **pre-post-questionnaire**
- **Focus groups** on smart charging strategies (4 online and 1 face-to-face group)

Results: Mobility Behavior

- Main trip purposes: leisure (53 %), university (22 %)
- Main means of transportation: bicycle (43 %)
- **Total number of trips increased** in Phase B with e-scooters available
- E-scooters are used for **short distances** (~ 4 km) and mainly replace bicycles, public transportation, and walking

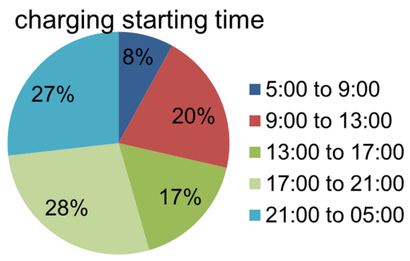


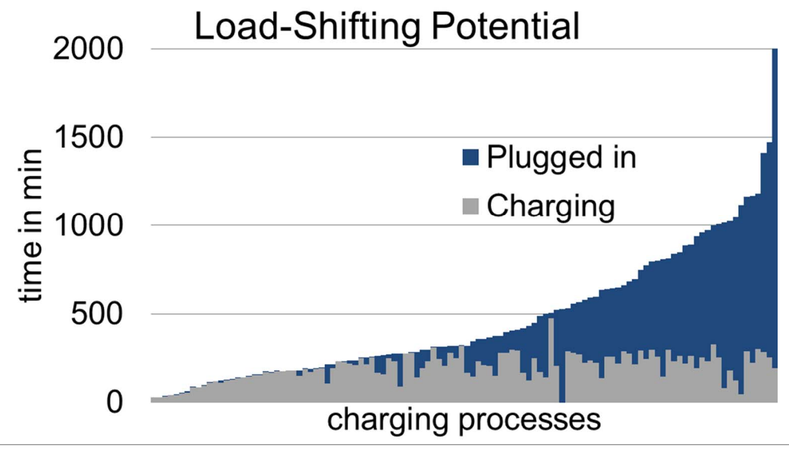
- **No dominant parking location for e-scooters**
- 35 % on public grounds → dominant for short periods
- 32 % on semi-public grounds → on campus locations
- 32 % on private grounds → especially for longer periods



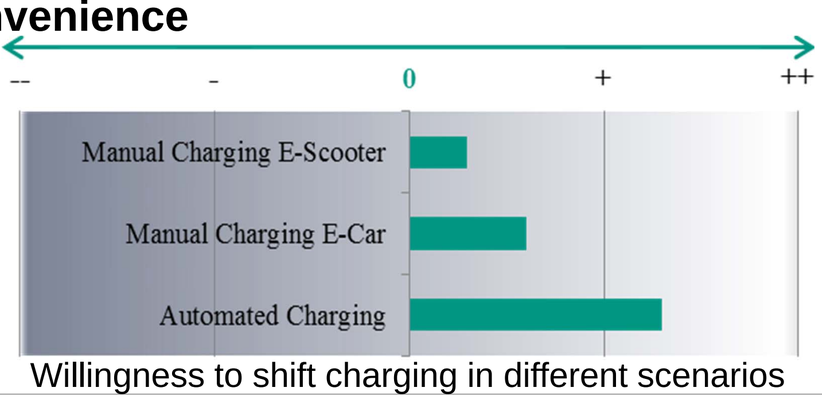
Results: Charging Behavior

- Main charging strategy: only when necessary (9 % prior to trips)
- Charging mainly took place at evening/night-times
- **High load-shifting potential**, (i.e. time difference between the car being plugged-in and charging)





- **Electricity prices played no role** in the field-operational-test
- Decisive factor for charging: need (battery status), organizational effort when no public infrastructure available
- Willingness to shift charging depends on
  - **Charging costs and saving potentials**
  - **Smart charging solutions for more convenience**



Willingness to shift charging in different scenarios