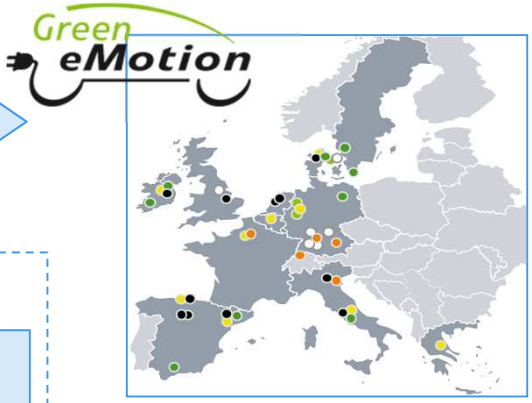
# Green eMotion - Data collection task



## RAW DATA

Structural Data

Static Data

Dynamic Data

**Items:**
- Charging points
- Electric vehicles
- Users

## WORK PACKAGE 1

## STATISTICAL ANALYSIS

### DATA PREPROCESS
- Automatic data format check
- Data quality assessment
- Data cleaning and filtering
- Merge data into production database

### DATA ANALYSIS
- Descriptive statistics
- Visual representation
- Summary tables
- Advanced Data mining

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# Green eMotion – Demonstration Regions

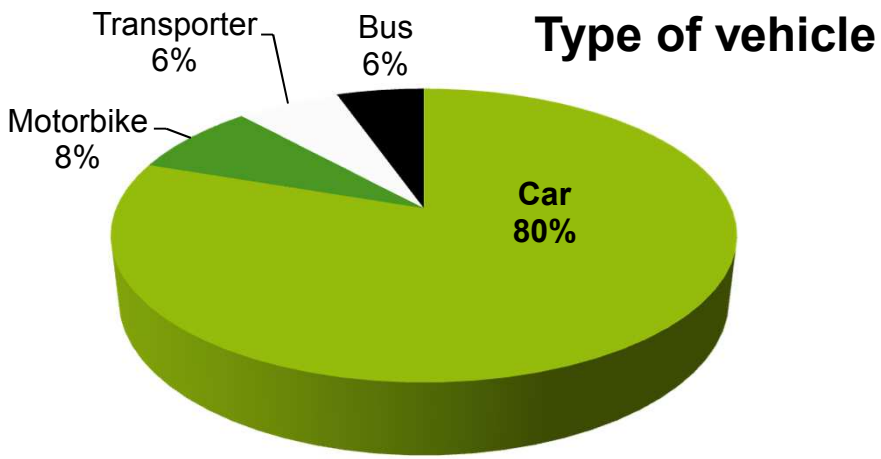

13 Demo Regions from 7 European countries

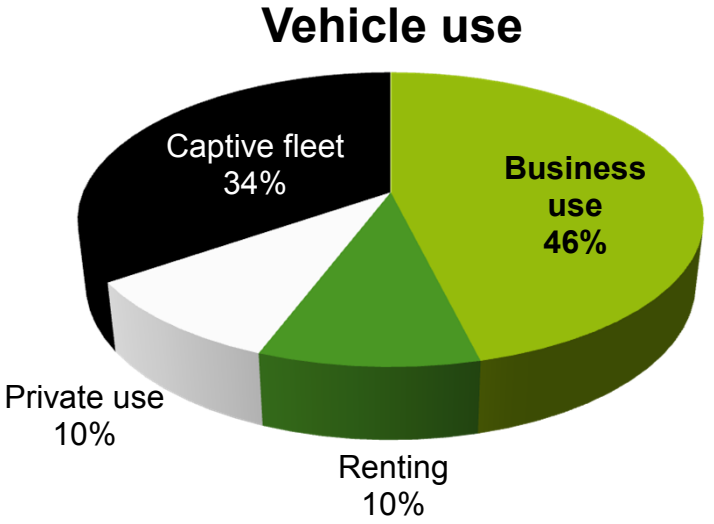
| | 2011 | 2012 | 2013 | Monitored % |
|---|---|---|---|---|
| Electric vehicles | 235 | 536 | 446 | 85% |
| Charging points | 598 | 1728 | 1197 | 66% |
| Users | 269 | 924 | 1169 | 60% |

| | | Total uses |
|---|---|---|
| Charging points | | 143 704 |
| Electric vehicles | Trips | 103 983 |
| | Charging events | 68 327 |

Each demo region is expanding the network of monitored assets through deploying larger EV fleets and the ongoing installation of smarter infrastructure. As the project matures, the amount and quality of the information improves.

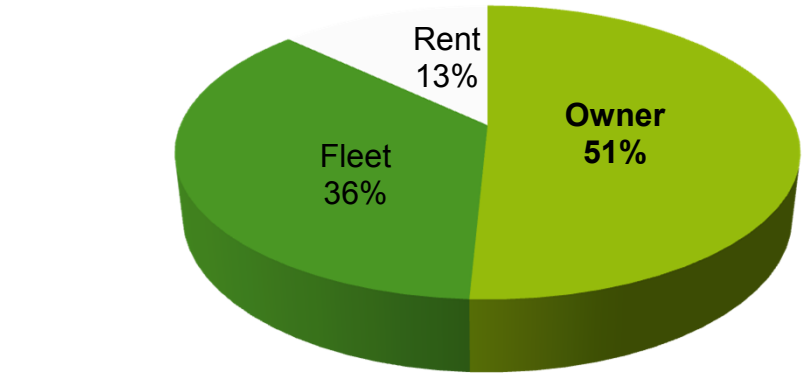
# Vehicles, owners and use



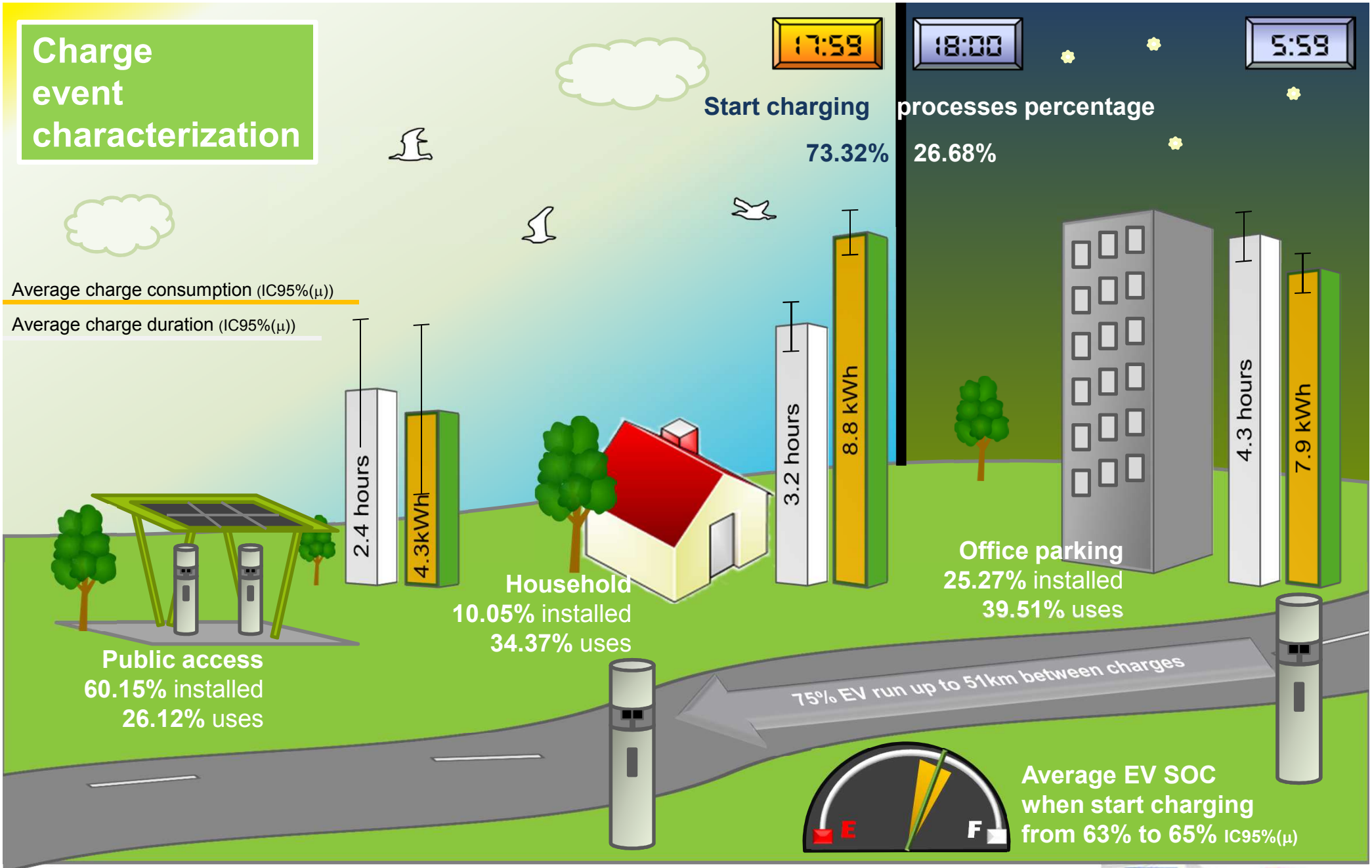




VEHICLE MAKE AND MODEL COUNTS

| Make | Model | Count | Percentage (%) |
|---|---|---|---|
| Renault | Fluence ZE | 227 | 44,95% |
| Daimler | Smart | 87 | 17,23% |
| Think | City | 27 | 5,35% |
| Mitsubishi | i-MiEV | 24 | 4,75% |
| Peugeot | iOn | 23 | 4,55% |
| Tecnobus, S.p.A. | Gulliver 520 | 20 | 3,96% |
| Vectrix | VX1 | 20 | 3,96% |
| Piaggio | Porter | 14 | 2,77% |
| Castrosua | Tempus GNC | 13 | 2,57% |
| Renault | Twizy | 12 | 2,38% |



# Charge event characterization



# Pattern sequence analysis

Represent *car life trajectories* as sequences of charging, trip and parking events.

| EV CODE | Initial Timestamp | Final Timestamp | Type | |
|---|---|---|---|---|
| ... | | | | |
| DR1_EV0001 | 2012-05-12 07:08:49 | 2012-05-12 07:22:09 | trip | |
| DR1_EV0001 | 2012-05-12 07:22:09 | 2012-05-12 12:45:58 | parking | |
| DR1_EV0001 | 2012-05-12 12:45:58 | 2012-05-12 13:18:36 | trip | |
| DR1_EV0001 | 2012-05-12 13:18:36 | 2012-05-12 13:18:43 | parking | |
| DR1_EV0001 | 2012-05-12 13:18:43 | 2012-05-12 14:00:27 | charge | |
| ... | | | | |

# Charge typology

**Low Charge** (37% Charge events)

83.6% Initial SOC

11.1% SOC increment

**Medium Charge** (38% charge events)

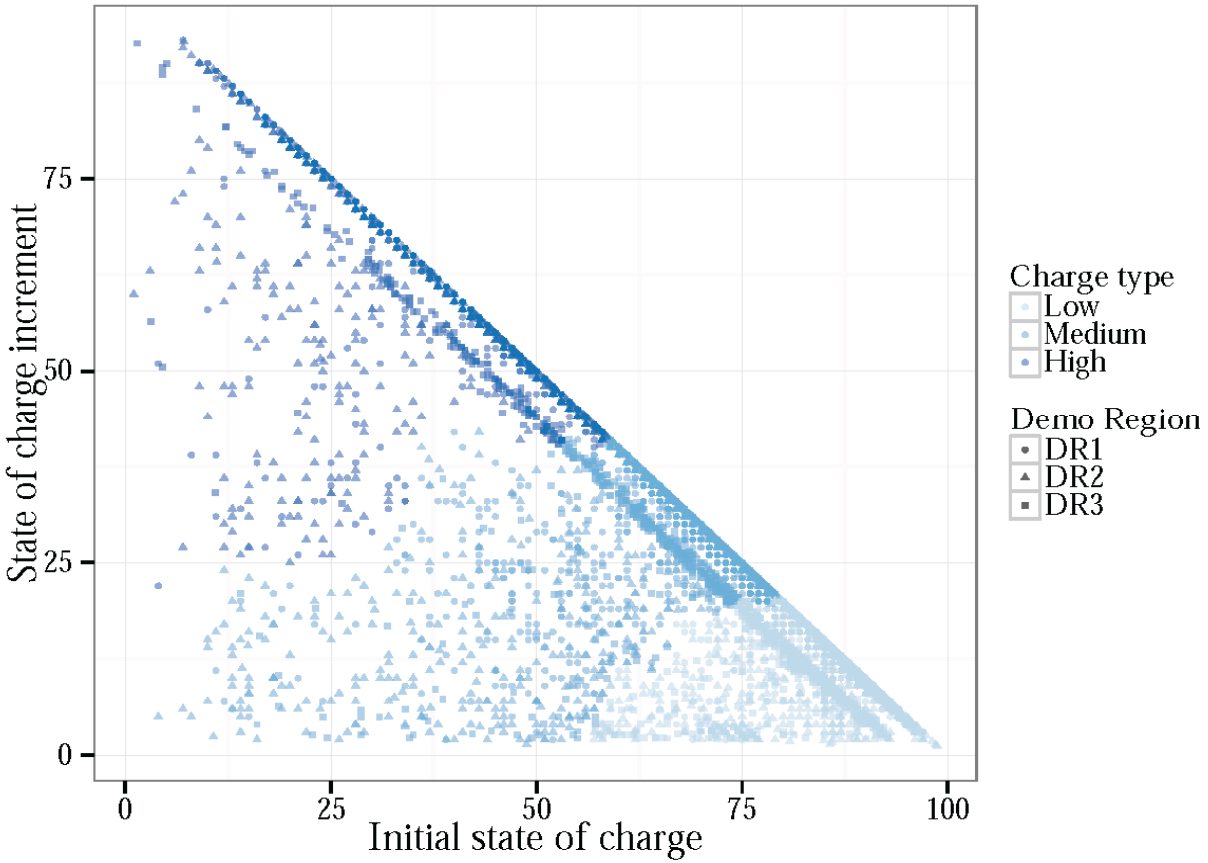
62.2% Initial SOC

26.5% SOC increment

**High Charge** (25% charge events)

39.5% Initial SOC

55.7% SOC increment




Based on over 7000 observations

# Trip typology

**Short-Slow Trip** (37% trip events)

3.1km trip distance

15.3km/h trip average speed

**Average Trip** (48% trip events)

5.4km trip distance

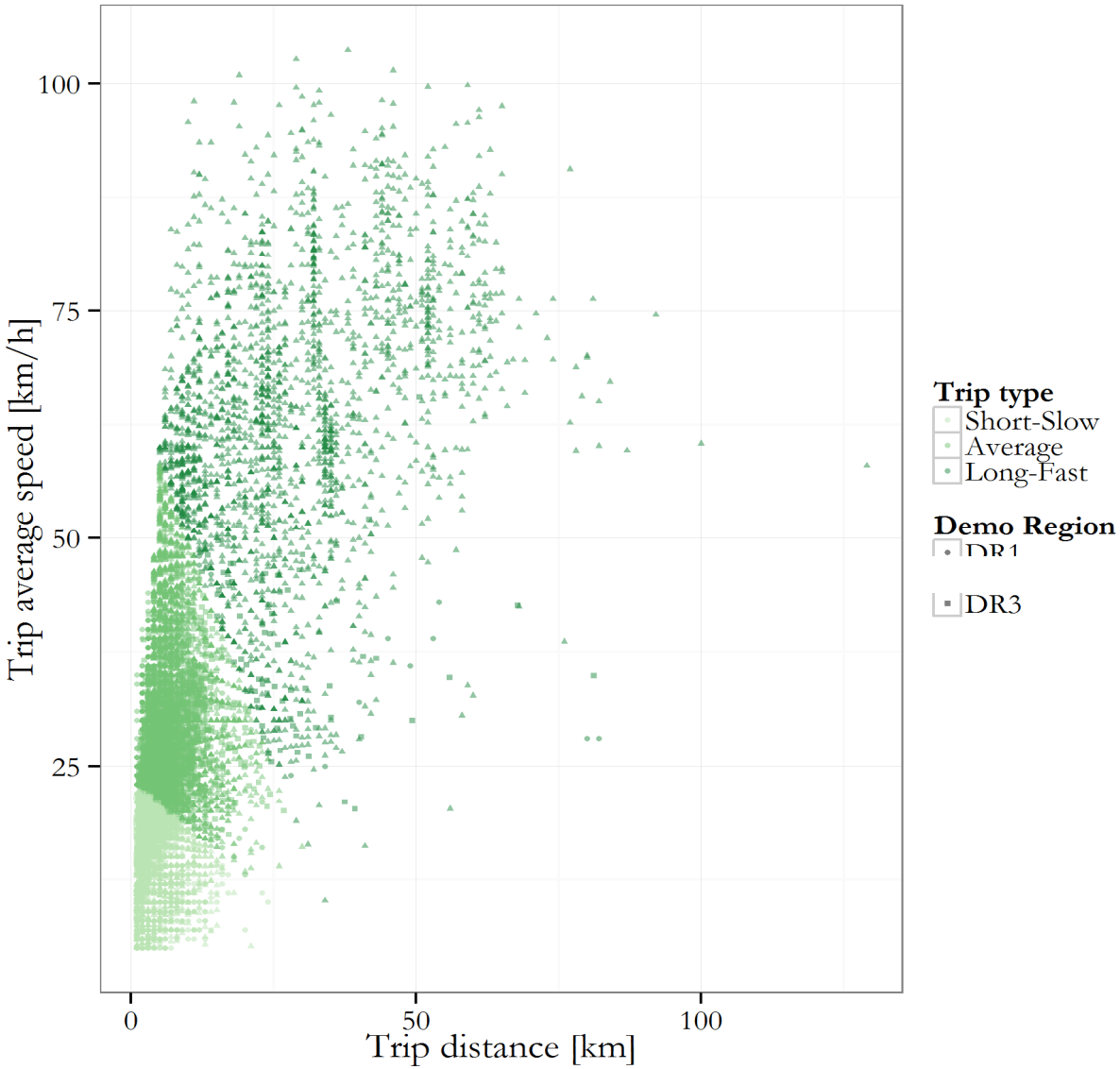
29.3km/h trip average speed

**Long-Fast Trip** (15% trip events)

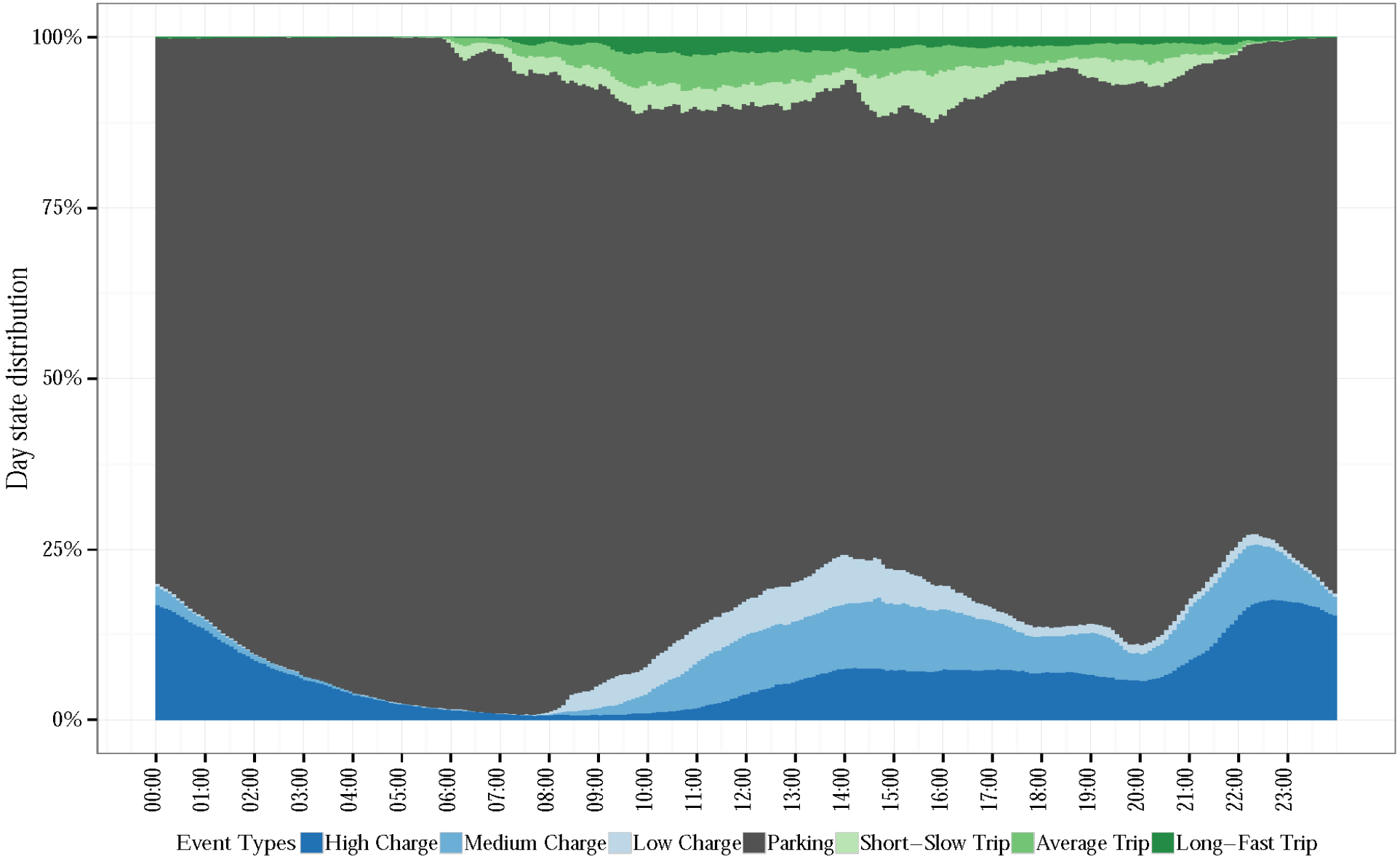
28.2km trip distance

62.2km/h trip average speed

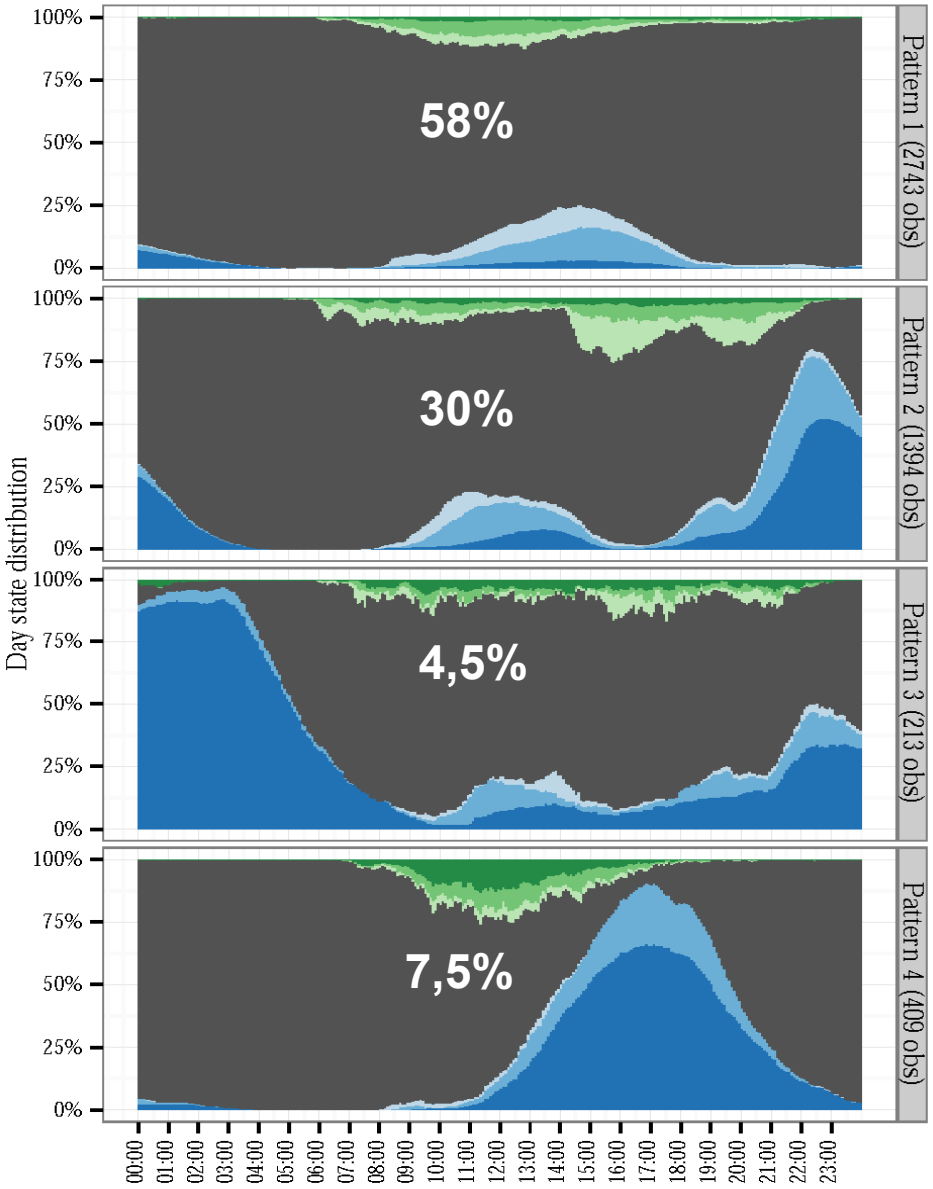
Based on over 25000 observations



# Day state distribution



# Day state clustering




* **Low activity day**, few charge and trip events
* Trips in the morning, charges in the afternoon
* Mainly cars destined to **business use** and owned by private company.

* **Charge and trip alternation** during daylight and long charges late in the evening.
* Trips tend to be **short and slow**, charges medium
* Mainly cars destined to captive fleet use and owned by **municipality**.

* **High charge and trip activity**. Charges concentrated at night and trips distributed all day long.
* Charges tend to be heavy, trips long and fast.
* Mainly cars destined to **renting use** and owned by municipalities.

* **Trip in the morning**, **charges during the afternoon** with almost no activity at night
* Charges tend to be heavy, trips long and fast
* Mainly cars destined to business use and owned by **private company**.

## Conclusions and applications

**The knowledge extracted can be applied:**

- To simulate the user car behavior required in other algorithms such as microgrid optimization.
- To provide accurate information about the charge cycles in order to estimate the EV battery life span.
- To realise client segmentation for car manufacturers and electric generation and distribution companies.
- To help policy makers to regulate and promote the use of EV with objective data.

# EVS27 – Green eMotion Project Session