



## A Behavioral Approach to Energy-efficient Driving

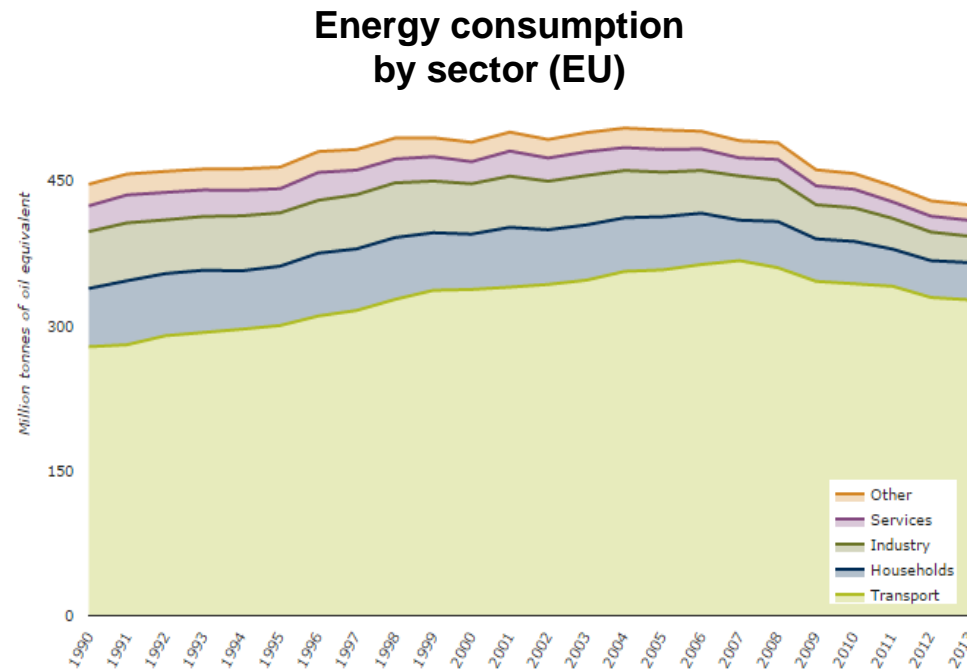
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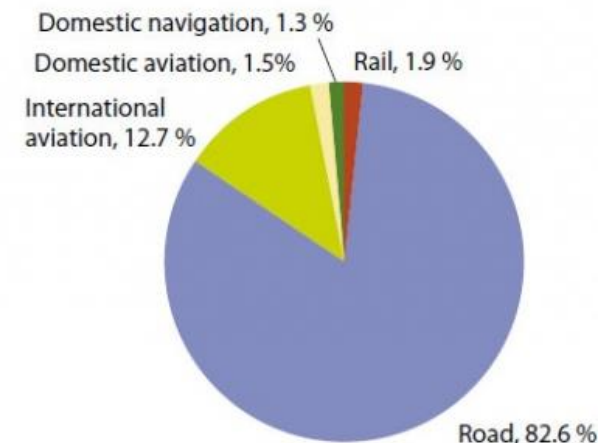
- 1 Motivation
- 2 Hintergrund
- 3 Forschungsziel und -methodik
- 4 Ergebnisse
- 5 Diskussion und Ausblick

## Der Transportsektor verantwortet weiterhin einen hohen Ressourcen- und Emissionsanteil.



Der Energieverbrauch des Transportsektors in Europa entspricht 3/4 des Rohölverbrauchs und 1/3 des Endenergieverbrauchs.




### Greenhouse gas emissions by transport mode (EU)



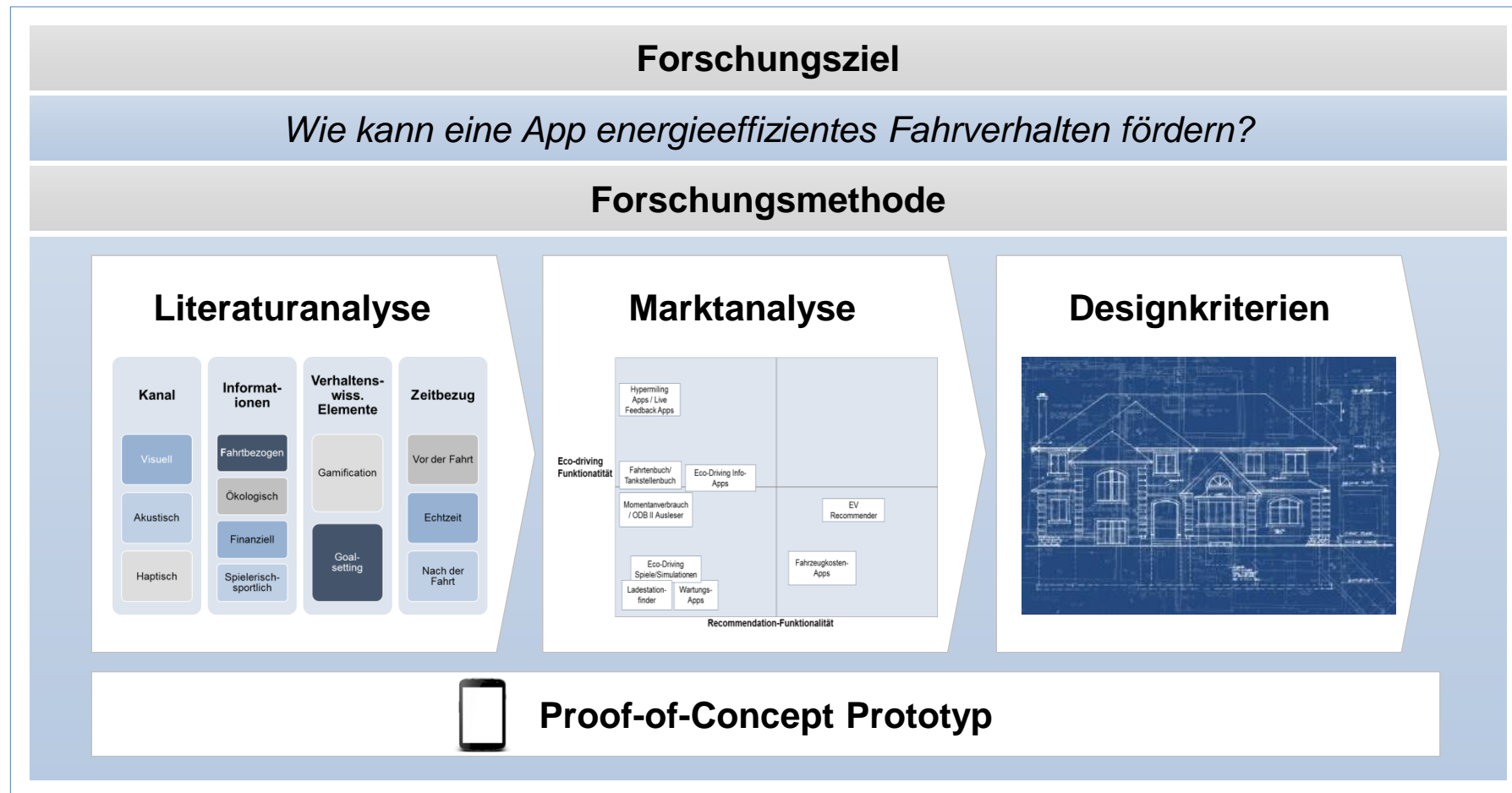
Über 80% der Verkehrsemissionen in Europa entstehen im Straßenverkehr.

Grafikquelle: eurostat (2015)

## Behavioral Economics und mobile Technologien werden auf die Förderung energieeffizienten Fahrens angewendet.

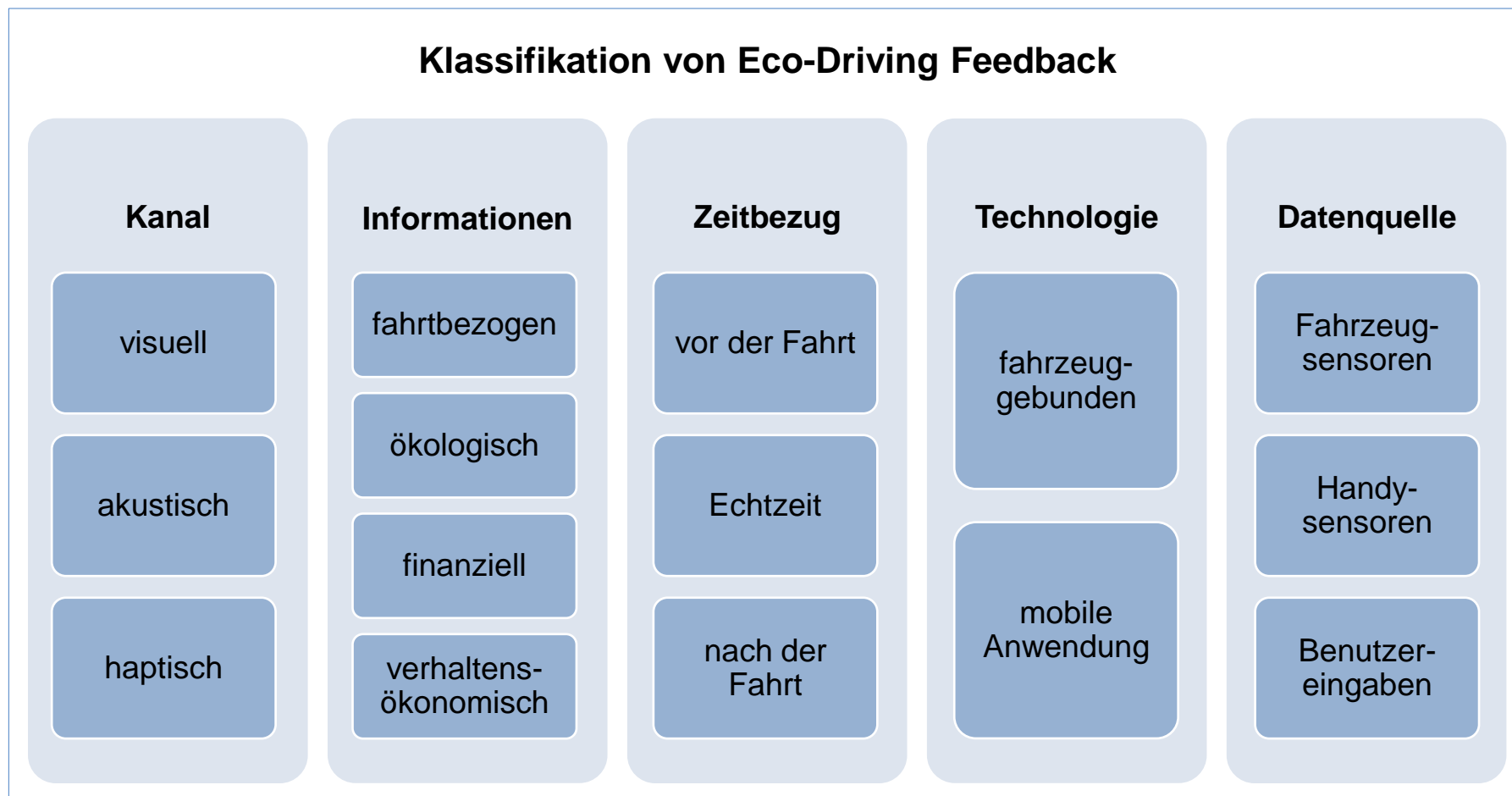
Behavioral Science	Mobile Anwendungen
<ul style="list-style-type: none"><li>▪ Menschliches Verhalten nicht rational</li><li>▪ Experimente zum „Anstoßen“ von Verhaltensänderungen („nudging“)</li><li>▪ Keine Gebote, Verbote oder ökonomische Anreize, sondern:<ul style="list-style-type: none"><li>▪ Beeinflussung des Entscheidungskontexts</li><li>▪ Nutzung sozialer Normen</li><li>▪ Interaktion</li><li>▪ Effektive Informationsvermittlung („framing“)</li><li>▪ Vereinfachung der menschlichen Schnittstelle</li></ul></li><li>▪ Anwendungen in Bereichen von Kriminalitätsbekämpfung, Gebäudeisolierung, Steuer, Heisswasserverbrauch etc.</li></ul>	<ul style="list-style-type: none"><li>▪ Hohes Potential mobiler Anwendungen zur Umsetzung von verhaltensbeeinflussenden Maßnahmen:</li></ul> <div><p>Vielseitigkeit &amp; Verfügbarkeit</p></div> <div><p>Geringe Time-to-Market</p></div> <div><p>Geringe Entwicklungskosten</p></div>

Es wurde eine Literatur- und Marktanalyse durchgeführt, um Designkriterien für eine mobile Anwendung zu identifizieren.



Vorhandene Praxislösungen und Forschungserkenntnisse stellen die Ausgangsbasis der Studie dar.

## Klassifikation von Eco-Driving Feedback



## Ergebnisse: Designkriterien

Das Ergebnis sind wissenschaftlich fundierte Designkriterien für eine mobile Anwendung.

High context  
feedback

Goal setting

Avoid  
information  
overload, post  
trip feedback

Efficient  
driving  
information

Game design  
/ gamification

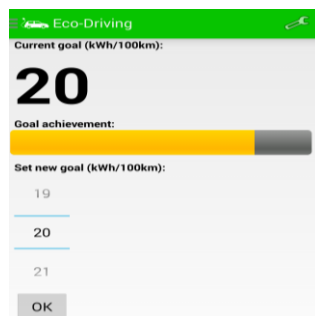
Social  
pressure /  
normative  
feedback

Adapting to  
driver  
motivation

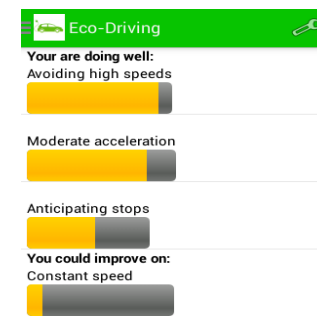
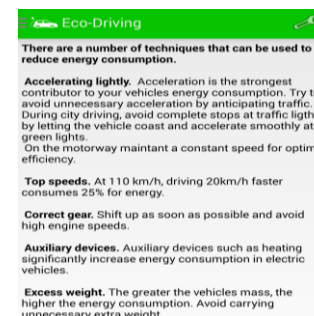
Range  
increase

Support  
electric  
vehicle use

In einem ersten Prototyp wurden Kriterien exemplarisch umgesetzt.



Avoid  
information  
overload, post  
trip feedback



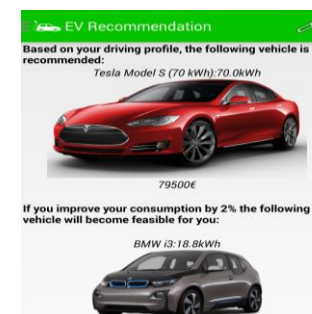
Social  
pressure /  
normative  
feedback

Adapting to  
driver  
motivation

Eco-Driving

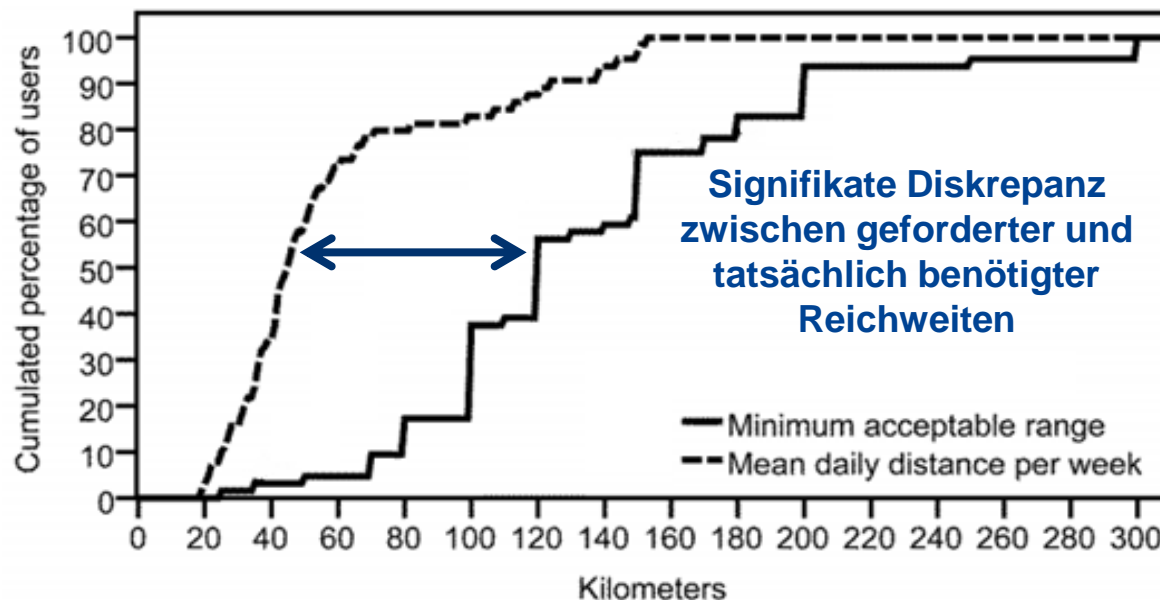
This table lists your consumption per 100km and personal range for each trip.

Date	kWh/100km	Personal Range	
09.7 08:56	24 kWh	77 km	☹
06.7 14:01	15 kWh	124 km	☺
06.7 10:11	15 kWh	124 km	☺
05.7 17:07	14 kWh	138 km	☺
05.7 17:00	17 kWh	110 km	☺
29.6 00:06	29 kWh	65 km	☹
28.6 23:45	11 kWh	168 km	☺
28.6 23:27	19 kWh	101 km	☺
25.6 15:53	23 kWh	80 km	☹
25.6 15:53	20 kWh	93 km	☹
25.6 15:53	23 kWh	82 km	☹
25.6 15:53	21 kWh	90 km	☹
25.6 15:53	19 kWh	101 km	☺
25.6 15:52	23 kWh	80 km	☹



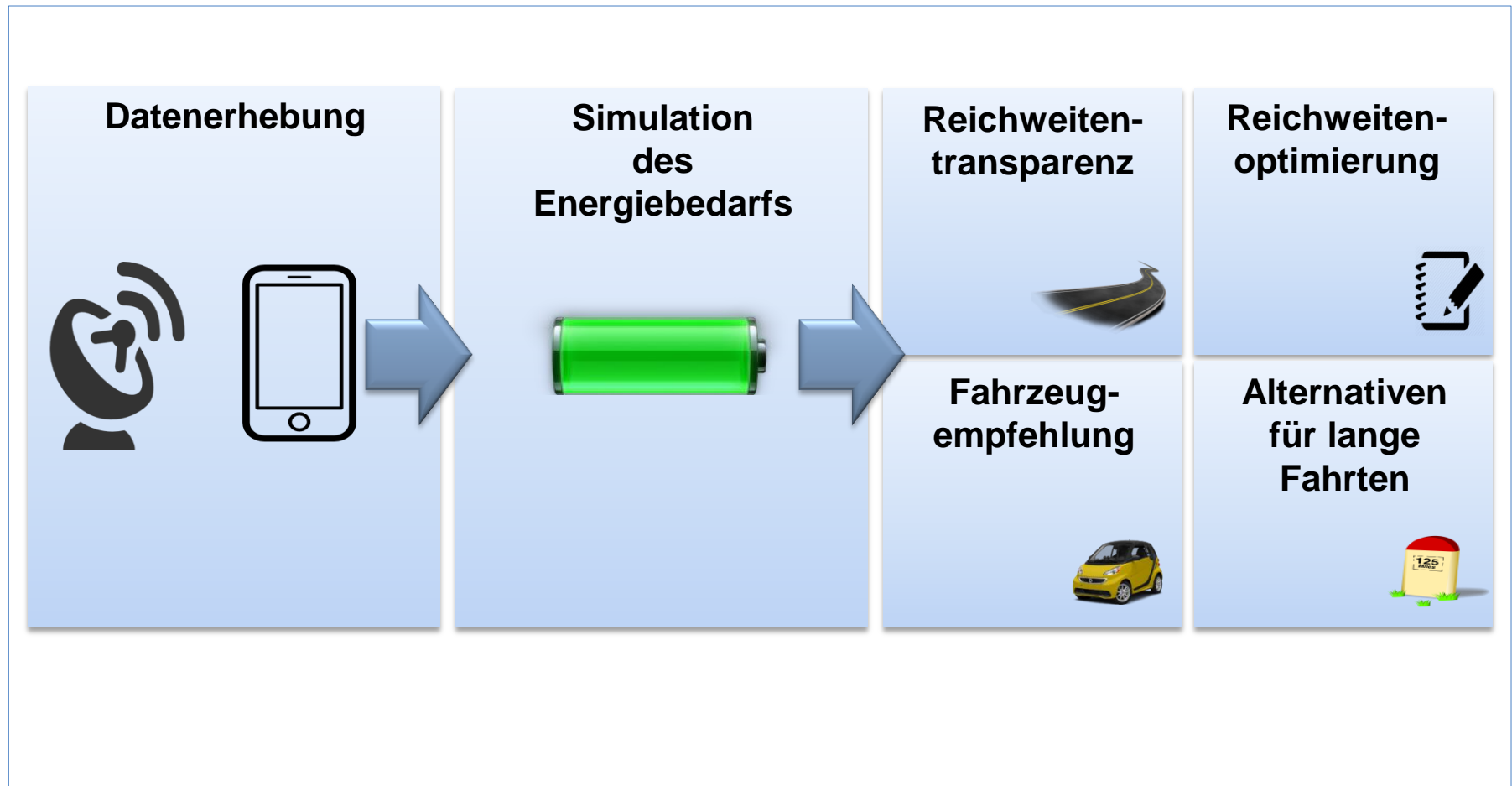


Das Phänomen „Reichweitenangst“ zeigt, dass im Kontext der E-Mobilität Entscheidungen nicht gänzlich rational erfolgen.



Grafikquelle: In Anlehnung an Franke & Krems (2012)

Auf Basis individuell erhobener Fahrdaten kann eine App rationalere Entscheidungen unterstützen.



# Fahrzeugempfehlung auf Basis möglicher Anpassungen

Individuelle Empfehlungen heben Vorteile und Verhaltensanpassungen hervor zur Förderung von E-Fahrzeugen.

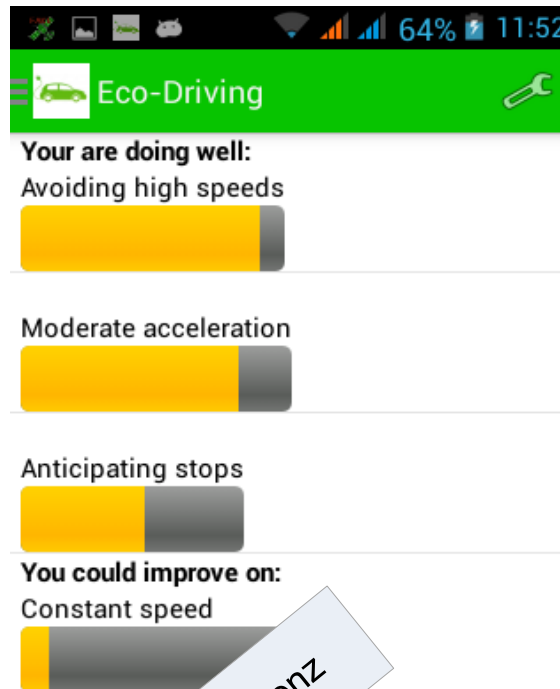
**Analysis**

The trips highlighted in red are critical due to high energy consumption. Consider using a different vehicle or means of transportation for these trips.

Date	Distance	Energy
10.6 11:50	24 km	4,77 kWh
10.6 11:49	18 km	3,64 kWh
10.6 11:49	109 km	21,75 kWh
10.6 11:48	17 km	3,4 kWh
10.6 11:47	80 km	9,7 kWh
10.6 11:46	36 km	7,26 kWh

Transparenz

Verhaltensanpassung




Effizienz

**EV Recommendation**

Based on your driving profile, the following vehicle is recommended:


Tesla Model S (70 kWh): 70.0 kWh



79500€

If you do both:

Smart ED: 17.6 kWh



19610€

Which trips are...  
How can I improve my consumption?

Geringere Kosten

## Behavioral Economics und mobile Technologien können Verhaltensänderungen zur Steigerung der Energieeffizienz bewirken.

Nutzen	Einschränkungen
<ul style="list-style-type: none"><li>▪ Beispielhafter Feedback-Mechanismus, der Verhaltensänderungen bewirkt</li><li>▪ Wissenschaftliche, systematische Identifikation von App Design Kriterien</li><li>▪ Praxisnaher Prototyp</li></ul>	<ul style="list-style-type: none"><li>▪ „Reißbrett“ Prototyp, der weitere Feldstudien erfordert</li><li>▪ Quantifizierung des Einflusses von Verhaltenselementen auf Energieverbrauch notwendig</li><li>▪ Potentielle Seiteneffekte nicht untersucht</li></ul>
Ausblick	
<ul style="list-style-type: none"><li>▪ Kriterienkatalog als Grundlage für weitere Studien</li><li>▪ Sinnvolle Nutzung von Daten im Zuge der Digitalisierung, z. B. zur Bewirkung von Verhaltensänderungen</li><li>▪ Aussichtsreiche Produktentwicklungen, z.B. für energieeffiziente Fahrweise und E-Fahrzeugenempfehlung</li></ul>	



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