



E-Scooters Research Project (2009–2013)

Review of the most important project mid-term results



6. Project management and communication

- The first workshop of the E-Scooters Research Project took place in 2010 at the EMPA in St. Gallen. In a total of four sessions, initial finds about issues such as charging station infrastructures, safety, consumption measurement and environmental balance sheets were presented to about 50 experts.
- The second E-Scooter workshop took place in September 2011 within the framework of the Blue-Tech in Winterthur. Experiences from both Switzerland and abroad and new technological discoveries were presented.

Who is involved in the E-Scooters Research Project?

The interdisciplinary research team is composed of five partners:

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UNIVERSITÄT
BERN

IKAOE (Interdisciplinary Centre for General Ecology), University of Bern



EMPA

INTERFACE

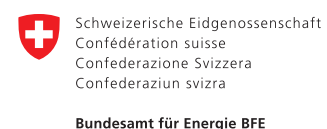
Interface Politikstudien
Forschung Beratung (Political Studies
Research and Consultancy), Lucerne

URS SCHWEGLER
Verkehrsplanung

Urs Schwegler Verkehrsplanung,
(Office for Transport Planning),
Rorschach



Paul Scherrer Institute (PSI),
Villigen



The Research Project received funding
from the Swiss Federal Office of Energy (SFOE),
the Swiss Federal Roads Office (FEDRO) and
the Federal Office for the Environment (FOEN).

What are e-scooters (electric scooters)?

In this context, e-scooters are understood as both two- and three-wheel electric motor vehicles. For example, this category includes the Swiss Post's three-wheel vehicle (Kyburz) or the Segway (see Picture 1: pgo, Kyburz and Segway e-scooters).



e-scooter: pgo



e-scooter: Kyburz DXP



e-scooter: Segway

Why organise a research project on e-scooters?

E-scooters can significantly contribute towards a reduction of energy consumption, greenhouse gases, air pollution, noise and traffic space. Moreover, they substitute a considerable amount of car mileage. Thus, e-scooters represent a clear-cut improvement in terms of the environment and health in comparison with petrol scooters.

In Switzerland, e-scooters have been available since the 1990s. However, their launch and distribution on the market are not satisfactory. Possible reasons for those facts are lack of awareness, a small distribution network, the limited range and cost of e-scooters.

What are the objectives of the E-Scooters Research Project?

- Contribution towards the technical development of e-scooters
- Support for the launch on the market of e-scooters
- Analysis of the effects of e-scooters on energy consumption, the environment and mobility behaviour

How is the E-Scooters Research Project organised?

The Research Project is composed of six work packages:

1_ Players and market development

- Who manufactures, imports and sells e-scooters and what are their needs?
- How is the e-scooter market developing?
- What factors influence the market's development?

2_ Technology

- How reliable are e-scooters?
- How can the battery lifetime be optimised?
- How could a cost-effective and user-friendly charging station infrastructure be set up in Switzerland?
- What safety aspects must be taken into consideration specifically in the context of e-scooters?

3_ Promotional measures

- What are the advantages and disadvantages of promotional measures (e.g. financial incentives or exhibitions)? Which ones are particularly appropriate for e-scooters?

- Have existing measures already proven to be successful?
 - Which combination of measures would be ideal?
 - Do the planned measures make sense?
- #### 4_ Energy and the environment
- What effect does the usage of e-scooters have on energy and the environment?
 - What is the turnover of energy and material in the full lifecycle of an e-scooter, i.e. for its production, use and disposal?
- #### 5_ User behaviour
- How are e-scooters used in daily life? What are the e-scooter users' experiences?
 - What is the effect of the purchase of an e-scooter on individuals' mobility behaviour?
- #### 6_ Project management and communication
- This work package includes: the contents of the overall project and its administrative management.

Do you have any further questions about the E-Scooters Research Project?

For further information,
go to the following websites:
www.ikaoe.unibe.ch
www.newride.ch

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The most important mid-term results of the E-Scooters Research Project

1. Players and market development

- In the autumn of 2009 and 2010, the world market leaders (BMW, Honda, Piaggio, Peugeot, Suzuki and Yamaha) presented their promising new e-scooter models at the EICMA in Milan, one of the most important motorbike fairs in Europe. However, announcements about their launch on the market have been vague.
- In Switzerland, approximately 45,000 motorbikes are put into circulation a year. 22,000 of these motorbikes are scooters. The market potential of e-scooters should include more than just users of petrol scooters: on the one hand, new customer segments can be targeted thanks to the ecological and fun aspects of e-scooters; on the other, engineers and designers can be inspired by their electric engine, leading them to think up new vehicle concepts.
- E-scooter providers' sales in Switzerland have not reached overall expectations since 2009. There are several reasons for this: high cost of purchase; insufficient maximum speed of 45 km/hour; delivery difficulties; and salespeople's insufficient levels of commitment.
- A survey carried out amongst e-scooter dealers in German-speaking Switzerland has demonstrated that many dealers are not convinced by e-scooter products such as they exist today, which is why they do not actively promote their sale. However, a large proportion of the dealers see great future potential in e-scooters.
- Experiences in other countries indicate that subsidies alone will not improve the market launch of e-scooters. Rather, an ideal combination of communication and infrastructure measures (e.g. charging stations) as well as good testing possibilities would be required.

2. Technology

- Since 2009, several improvements have been made in the context of charging stations:
 - In collaboration with BKW FMB Energie AG, a simpler charging option concept (weather-protected external power sockets) was developed. Within the framework of a pilot project, the Municipality of Koeniz has researched about a dozen such locations within its territory and opened several public charging stations. Following this action, a leaflet was published in collaboration with the building permit authorities aiming at builders, in which not only the significance of electric vehicle charging infrastructures is highlighted in general, but also those for e-scooters in particular.
 - Several other Swiss towns now provide external power sockets to the public in parking lots for two-wheel vehicles in front of their facilities.
 - LEMnet, the international directory for charging stations for electric vehicles included a new section for «electric two-wheelers» which lists the charging stations at which only two-wheel electric vehicles can be charged.
- In terms of safety, specific aspects were defined and researched for e-scooters:
 - The fact that e-scooters hardly make any noise when driven at low speed can pose a danger to pedestrians.
 - The inappropriate handling of batteries, chargers and cables can pose electronic and technical risks. However, these can be controlled if manufacturers and drivers are adequately informed and act correctly.

3. Promotional measures

- Swiss-Moto, the most important exhibition to promote e-scooters in Switzerland that takes place once a year in Zurich has been scientifically evaluated since 2009. Comprehensive surveys have been carried out with visitors, exhibitors and dealers. The recommendations of the evaluation reports have been taken into account in the preparation of the respective following Swiss-Moto exhibitions.
- The effects of an e-scooter test drive were analysed in a separate survey. 86 % of the respondents (N=86) were convinced that e-scooters would make a breakthrough on the market in the next five to ten years.
- The experiences of Switzerland and other countries with financial incentives in transport were summarised in a synthesis report. The mechanisms of action of various financial incentives were analysed, and their advantages and disadvantages were discussed. On the basis of this information, recommendations for the promotion of e-scooters were made.

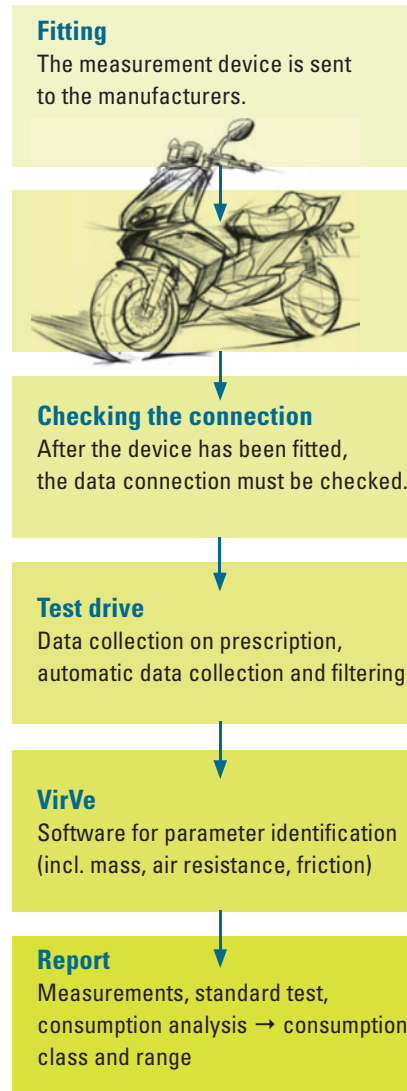
4. Energy and the environment

- Typical components of e-scooters were analysed in detail, focusing on material and energy consumption throughout the vehicles' lifespan (especially lithium-ion batteries, high-performance permanent magnet motors and power electronics).
- The eco-inventory of a modern lithium-ion battery was set up and was published in the largest eco-inventory database in the world (ecoinvent v2.2), thus making it accessible to a large public.
- At the moment, the eco-inventory for electric motors is being set up. The main focus is on the rare earth elements that are contained in the magnets.
- Currently, data about the energy and material consumption during the scooters' use is being collected and analysed, so as to be able to classify the effects of the battery and of other components on the environment in environmental balance sheet comparisons (see example in Picture no. 2).
- E-scooters in operation are practically emissions-free, so traditional consumption measurement methods are not applicable because they focus on the emission of air pollutants when the vehicles are in operation. That is why a simple, cost-effective, generally applicable method was developed for e-scooter consumption measurement. It does not make use of dynamometers and can be carried out in a very short amount of time and with a minimal amount of temporary retrofitting. This method allows the comparison between e-scooters' driving performance and range (cf. Picture 3).

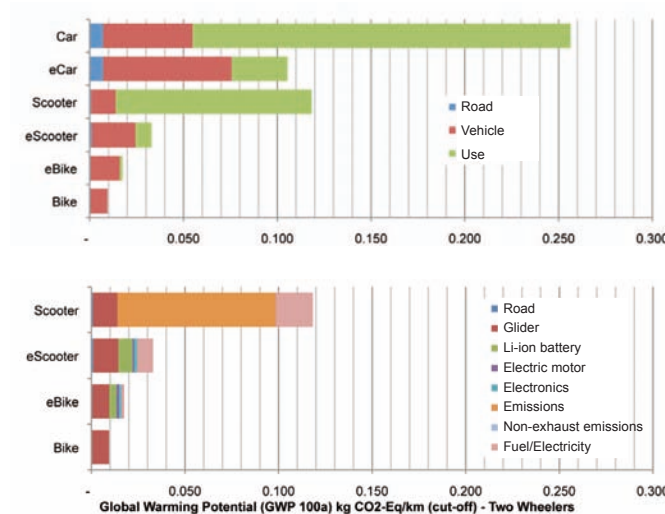
5. User behaviour

- A survey instrument that requires only little effort from the respondent but that enables the collection of key figures about individual mobility behaviour of e-scooter users was developed. The partial survey of e-scooter buyers could be launched. Overall, the collection of data will take longer than initially planned. The reason is that although financial incentives have been launched in seven Swiss towns (St. Gallen, Zurich, Bern, Basel, Fribourg, Neuchâtel and Lausanne), few e-scooters have been purchased.
- The first evaluation points towards the fact that e-scooters are mainly used by men aged 30 to 55 who use them to circulate in a town or in agglomeration areas.

Picture 3: Performance of a consumption measurement test



Picture 2:



The environmental balance sheet comparison of various vehicles demonstrates that, amongst other factors,

- an e-scooter only emits one quarter of the greenhouse gases emitted by a four-stroke engine petrol scooter;
- an e-scooter only emits approx. 12% of the greenhouse gases emitted by a four-stroke engine car (Golf);
- an e-bike only emits half the greenhouse gases emitted by an e-scooter.

