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Electric vehicles' enhanced performance and integration into the transport system and the grid

electrific

Enabling seamless electromobility through smart vehicle-grid integration

Project Nº 713864

Electrific

D10.2 – POPD – Requirement No. 2

Responsible:	GFI
Contributors:	UNIMA, FM, HTB, CVUT, UNIPASSAU, E-Wald, e-Šumava, Bayernwerk, THD, BCNecologia
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Executive Summary

This document, "**D10.2 - POPD – Requirement No. 2**", provides information on key ethical issues concerning research activities as identified and established according to European Union (EU) and national directives. It is focused on the procedures adopted by partners to carry out the Protection of Personal Data in compliance with (i) ethical principles (including the highest standards of research integrity – as set out in D.10.1)– and, in particular, (ii) in application of international, EU[1], and national laws.

[1] DIRECTIVE (EU) 2016/680 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA.

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Table of Acronyms and Definitions

Abbreviation	Explanation
ADAS	Advanced Driver Assistance System
CA	Consortium Agreement
CIM	Common Information Model
CVUT	Czech Technical University In Prague
e-Šumava	e-Šumava.cz s.r.o.
THD	Deggendorf Institute of Technology
UNIMA	University of Mannheim
UNI PASSAU	University of Passau
BCNecologia	Agencia D'ecologia Urbana De Barcelona
E-WALD	E-WALD GmbH
EC	European Commission
EU	European Union
EV	Electric Vehicle
H	Humans
ICT	Information and Communication Technology
NDA	Non-Disclosure Agreement
POPD	Protection of Personal Data
WP	Work Package

I. INTRODUCTION

I.1. Purpose and organization of the document

As defined by the European Commission (EC) "a proposal which contravenes ethical principles or any applicable legislation, or which does not fulfill the conditions set out in Decision No 2013/743/EU, in the work program, in the work plan or in the call for proposals may be excluded from the evaluation, selection and award procedures at any time"[2]. In that sense, in accordance with general relevant principles of ethics nature and on those following the application of international, European and National laws, this document contains a list of ethics requirements that represent relevant operative criteria for the Electrific project's development.

The 10.2 deliverable of Work Package (WP) 10 documents the ongoing analysis of the existing European and national rules about Protection of Personal Data (POPD). Detailed information is provided on privacy/confidentiality and the procedures that are implemented for data collection, storage, protection, retention and destruction.

To conduct properly Electrific's research it is important to collect data, often Personal Data. In that sense, the purpose of this document is to set out "ethics requirements" that Electrific Consortium partners (Consortium partners) must comply with related to POPD.

I.2. Scope and audience

This document is mainly a compilation of guidance offered primarily by the European Parliament, the European Council as well as by the independent European Union Advisory Body on Data Protection and Privacy. This document is assessed in the context of the European Union Data Protection Policy.

The document is intended to provide an overview of the major ethics requirements of this project. It aims at raising commitment about these concepts among the Consortium partners and at assisting them while beginning to develop their project researches.

[2] EUROPEAN COMMISSION, *Ethics Appraise and Societal Impact in 2020*, 2016. http://ec.europa.eu/rea/pdf/5_ethics_in_h2020.pdf

I.3. Document context

This document does not claim to cover every single matter that might arise in connection with personal data protection but envisages giving information on the main aspects of data protection in the context of research carried out by the Consortium.

This document should be consulted in parallel with the European Union (EU) Data Protection Policy, National Laws as well as with the Code of Ethics in Research. Finally, it must be borne in mind that, although the document provides information and explanations that are in strict compliance with the requirements and regulations in force, it remains open to adaptation whenever legal, pragmatic or technological developments allowed that adjustments.

II. FRAMEWORK OF "ETHICS REQUIREMENTS" BY THE EUROPEAN COMMISSION

Ethics is given the highest priority in the European Union (EU) funded research projects: all the activities carried out under Horizon 2020 must comply with ethical principles and relevant national, EU and international legislation, as the Charter of Fundamental Rights of the EU and the European Convention on Human Rights.

II.1. General definition

Ethics is an integral part of research from the beginning to the end of project activities. Ethical research conduct implies the application of fundamental ethical principles and legislation to scientific research in all possible domains of research – for example biomedical research, nature sciences, social sciences and humanities.

The most common ethical issues include:

- The involvement of humans, children, patients, vulnerable populations,
- The use of human embryonic stem cells,
- Privacy and data protection issues,
- Research on animals and non-human primates.

In order to mitigate and reduce the risk, European, national and international ethics bodies should collaborate actively and at multiple levels: within the EU, between the EU and other high-income countries, and between high-income and low-income countries, where the risks of dumping are higher. Good practices shall be identified with the aim of elaborating a code of conduct for all actors.

II.2. Protection of Personal Data

Data protection is meant to guarantee participant's right to privacy. As defined by the European Commission (EC) «Data protection refers to the technical framework and security measures designed to guarantee that all personal data are safe from unforeseen, unintended or malevolent use"[3]. **Data protection therefore includes both measures with regards to access to data and**

[3] EUROPEAN COMMISSION, *Guidelines on FAIR Data Management in Horizon 2020*, July 2016.

the conservation of data. Also measures to assure the accuracy of the data can be included in a data protection strategy. In the context of research, privacy issues arise whenever data relating to persons are collected and stored, in digital form or otherwise.

For the sake of completeness[4], it has to be noted that on January 25th 2012, the EC proposed a comprehensive reform of the EU data protection framework. Data Protection Directive was at the time of its adoption a huge step forward for the functioning single market as well as Protection of Personal Data (POPD) in the EU. However, the EC correctly argues that "existing rules provide neither the degree of harmonization required, nor the necessary efficiency to ensure the right to personal data protection"[5]. On December 15th 2015, the European Parliament, the Council and the Commission reached agreement on the new data protection rules, establishing a modern and harmonized data protection framework across the EU. On April 8th 2016 the Council adopted the Regulation and the Directive. And on April 14th 2016 the Regulation and the Directive were adopted by the European Parliament.

On May 4th 2016, the official texts of the Regulation and the Directive have been published in the EU Official Journal in all the official languages. While the Regulation will enter into force on May 24th 2016, it shall apply from 25 May 2018. The Directive enters into force on 5 May 2016 and EU Member States have to transpose it into their national law by 6 May 2018.

To this regard, the reform provides tools for gaining control of Europeans' personal data, which is a fundamental right in the European Union.

The data protection reform strengths citizens' rights and build trust. The new rules address these concerns through:

- A "right to be forgotten": When an individual no longer wants her/his data to be processed, and provided that there are no legitimate grounds for retaining it, the data will be deleted. This is about protecting the privacy of individuals, not about erasing past events or restricting freedom of the press.
- Easier access to one's data: Individuals will have more information on how their data is processed and this information should be available in a clear and understandable way. A

[4] EUROPEAN COMMISSION, Reform of EU data protection rules, October 2016.

[5] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

right to data portability will make it easier for individuals to transmit personal data between service providers.

- The right to know when one's data has been hacked: Companies and organizations must notify the national supervisory authority of data breaches which put individuals at risk and communicate to the data subject all high risk breaches as soon as possible so that users can take appropriate measures.
- Data protection by design and by default: 'Data protection by design' and 'Data protection by default' are now essential elements in EU data protection rules. Data protection safeguards will be built into products and services from the earliest stage of development, and privacy-friendly default settings will be the norm – for example on social networks or mobile apps.
- Stronger enforcement of the rules: data protection authorities will be able to fine companies who do not comply with EU rules up to 4% of their global annual turnover.

As defined in *WP10 -D.10.1*, in legal terms, "Personal data" means[6]:

- Any information relating to an identified or identifiable natural person referred to as 'data subject'; an identifiable person is one who can be
- Identified directly or indirectly, in particular by reference to an identification number or to one or more factors
- Specific to his or her physical, physiological, mental, economic, cultural or social identity.

The main challenge for research projects is to use and share the data, and at the same time to protect all identifiable information to guarantee personal privacy. The personal data needed in research can include:

- Health information
- Genetic information
- Information on behavior such as criminal records,

[6] EUROPEAN UNIVERSITY INSTITUTE (EUI), *Guide on Good Data Protection Practice in Research*, May 2016.

- Financial information
- Travel records
- Information on religious beliefs and sexual orientation or ethnic identification records.

For the scope of Electrific, besides what we defined as personal data in "*D.10.1. - Section IV.2.1.a*" personal data is also related to information on behavior, travel records and financial information.

II.2.1. Proportionality

In Research, often more data are collected than necessary raising the question of proportionality. For example, when conducting a survey, the full identity of participants is registered when only some basic demographic information would suffice.

Personal data collection must be adequate and relevant. The principle of proportionality is also important in other domains. Partners of the project should always search for alternatives and the methods used must be proportional to the research objectives.

"Data quality" is the aim and this is achieved when the data processed are:

- Adequate, relevant and non-excessive (e.g. by minimizing collected information/database fields);
- Accurate and where necessary, kept up to date;
- Processed fairly and lawfully;
- Processed for limited and specified purposes and not further processed in a way incompatible with these purposes;
- Processed in line with data subjects' rights;
- Processed in a secure manner.
- Kept for no longer than necessary for the purposes for which the data was collected or for which it is further processed.

II.2.2. Anonymization, codification and identifiable information

When dealing with privacy and data protection issues, it is important to correctly distinguish between the following categories of data: When personal data are collected, processed and stored, these data can remain identifiable, they can be codified or completely anonymized.

Anonymized data are data that cannot be linked back to the individual.

Common Anonymization Techniques:

- Randomization as a technique that alters the veracity of the data in order to remove the strong link between the data and the individual. If the data are sufficiently uncertain then they can no longer be referred to a specific individual.
- Generalization as an approach consisting of generalizing, or diluting, the attributes of data subjects by modifying the respective scale or order of magnitude (i.e. a region rather than a city, a month rather than a week).
- Pseudonymization as a hybrid technique referring to the process of disguising identities by replacing one attribute (typically a unique attribute) in a record by another.

Codified data are data where the most obvious identifiers such as names and addresses are replaced with an indirect system of identification, usually through codes. It remains possible to link the indirect identifiers with names and addresses. For each category of data, different rules might apply.

III. ELECTRIFIC'S SELF-ASSESSMENT OF ETHICS ISSUED RELATED TO PROTECTION OF PERSONAL DATA

This section describes the means the Consortium used to identify the key project areas that deals with data related to Protection of Personal Data:

- First of all, the consortium responded to the self-assessment questionnaire proposed by the EC through the Participant Portal to help applicants in getting proposals "ethics-ready" for Horizon 2020 funding. The replies provided to the questionnaire served as a useful starting point for further developing the analysis described in this deliverable.
- In order to have more details about project areas impacted by protection of personal data measurements WP10's leader created and sent questionnaires in order to perform a more specific self-assessment with every Consortium partner.
- Based on answers from the abovementioned partner self-assessment, we elaborated a detailed analysis of these areas.

As result of this self-assessment this section concludes with the identification of the partners that will deal with protection of personal data.

III.1. Electrific's Self-Assessment based on European Commission questionnaire

This section details an excerpt of the ethics issues self-assessment questionnaire provided by the EC at proposal submission phase, and fulfilled by the Consortium on October 15th 2015. This questionnaire helped the Consortium to first identify any ethics issues that may arise from our proposal and second to propose initial actions to correctly deal with these issues.

Hence, this self-assessment questionnaire has been used as input on "how to" manage data and protect volunteers, partners and other researcher colleagues. Our responses were an opportunity - and an obligation - to start thinking about respecting ethics regulations as well as considering actions the Consortium commits to implement.

Finally, this exercise helped us to identify Consortium partners who deal with data protection procedures.

Question 1. The applicants must commit to obtaining opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority (which ever applies according to the Data Protection Directive (EC Directive 95/46, currently under revision, and the national law).

The Consortium commits to obtaining Ethical approvals both for the Use of Personal Data for Profiling and POPD by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority (which ever applies according to the Data Protection Directive (EC Directive 95/46, currently under revision, and the national law).

Question 2. Detailed information must be provided on the procedures that are implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation.

Same request and therefore reply as above.

Question 3. 'The applicant must explicitly confirm that the existing data used are publicly available'.

The Consortium partners confirms that the existing data used are publicly available.

Question 4. The applicant must define and elaborate privacy protection of "Driver Information Model" and "Psychological user profiling" and generate a risk mitigation plan.

As clarification, the Grid information model (WP4), the Car information model (WP5), the Psychological user profiling (WP6) and Driver information model (WP7) are generalized in the Common Information Model (WP3). At implementation time, all data provided to the common information model is anonymous so no private data is managed at any moment. As example, driving and Advanced Driver Assistance Systems (ADAS) related data is shared anonymously by the trial partners (E-WALD, E-Šumava, BCNecologia) and coordinated with psychological data only by the research partner (UNIMA). If necessary, these data are shared back to applied partners only without personal key. Same approach is applied in the case of other private data (like car or energy production) if necessary.

III.2. Electrific's Self-Assessment based on WP10's leader questionnaire

As explained in *D.10.1* we performed an internal self-assessment in order to have detailed information to comply with ethical principles and applicable international, EU and national law. Questions contained in the questionnaire, listed in Table 1 in "*D.10.1. - Section III.2.*" follows guidelines from Grant manual ethics section provided by European Commission. Answers of each partner were analyzed and summarized in "Section IV". The original document which contains answers of this exercise is unsuitable formatted (big table) to be contained in comprehensive form in this document. Abstract (screenshot) regarding data protection is attached in "*D. 10.1., Section V.18 – Appendix R* ".

The original document is stored in the project collaboration platform and is available for all Consortium partners, ethics board and EU review and project officers.

III.3. Identified project areas impacted by POPD

III.3.1. WP3: Common Information Model

Based on data from cars, chargers, user travel histories, grid status, renewable energy availability and the local driving context (weather, geo-information, traffic information, etc.), Freemind (as WP3 leader) elaborates the Electrific's Common Information Model (CIM).

The CIM centralizes and homogenizes the access to the data coming from smart chargers and EV fleet management systems. It is composed of the assets and attributes from these systems, and metrics. It describes exchange information with the Grid and EV management systems and with the Driver Assistance Services. The data is managed by applying big data technologies as it includes not only current data but also historical information (e.g. useful for the user profiling) and predictive (power that is needed for charging EVs in the next period of time).

The model aims to organize this information to enable Information and Communication Technology (ICT) processing. For the project, this tool is an energy-aware travel planning solution that adds the complexity of the human mobility factor to the system in order to optimize energy consumption, costs and car range and battery life. Roaming management (e.g. different energy providers, different charging pricing and conditions) is experimented in a cross-border trial with EV fleets from Germany (E-WALD) and the Czech Republic (E-Šumava).

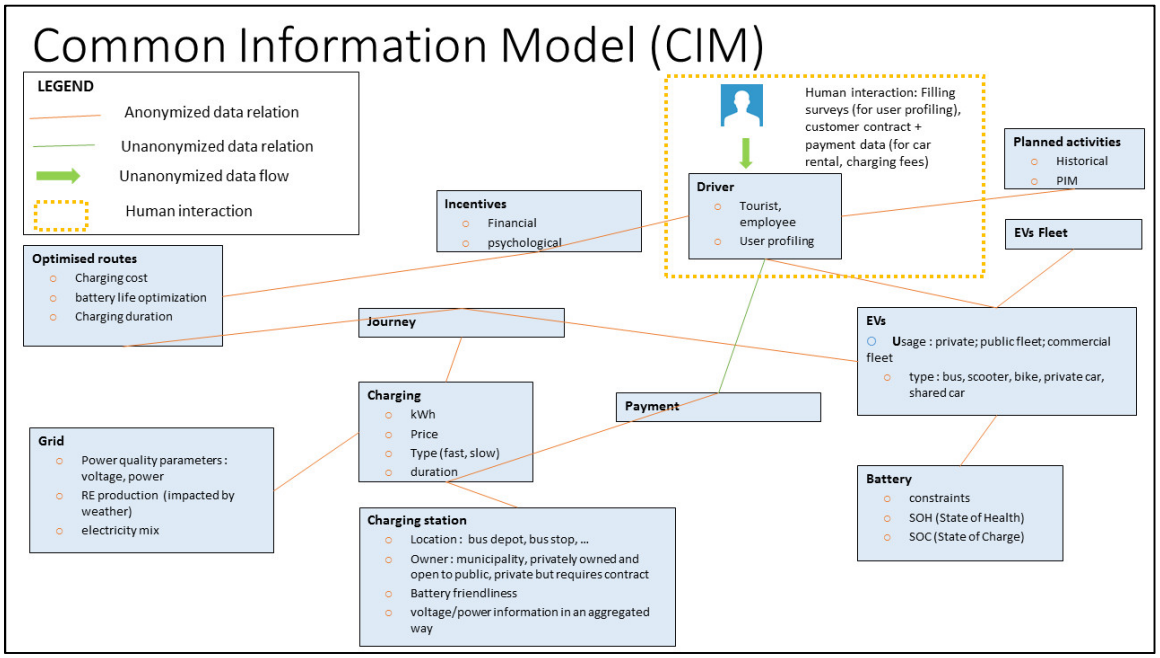


Figure 1. Eletrific's Common Information Model.

As defined in WP3, the Common Information Model (CIM) is deployed, configured and used in the experiments and trial environments. This allows to analyze the results of the trials performed in WP8.

As mentioned in "*D.10.1. Section III.3. High level architecture without data flow*" according to project plan, final common information model and high level architecture is due M6 and M8 respectively. Any changes that could affect conclusions and results of analysis performed in this deliverable described in this section going to be reassessed according to general principles defined in Sections IV.7. and IV.8.

III.3.2. WP6: Psychological user profiling

Data concerning EVs participating in the system and their respective drivers is considered and collected. This includes technical data, mainly detailed information from the EV's battery management system (e.g. state of charge and state of health and data gathered from the car's ADAS such as journey distance, vehicle speed, geo location or charging profile). Anonymized information on drivers is collected from personal information managers (e.g. personal planning tools) and/or enterprise resource planning systems. This may include, but is not limited, to user

ID, policies, schedule and contacts of the driver alongside other psychological variables coming from surveys.

The aforementioned data are gathered to form three pools of information namely:

- "Grid Information Model"
- "Car Information Model"
- "Driver Information Model"

As mentioned in "*D.10.1. Section III.3. High level architecture without data flow*" according to project plan, final CIM and high level architecture is due M6 and M8 respectively. Any changes that could affect conclusions and results of analysis performed in this deliverable described in this section is going to be reassessed according to general principles defined in Sections IV.6. and IV.8.

As clarification, the Grid Information Model (WP4), the Car Information Model (WP5), the Psychological user profiling (WP6) and Driver Information Model (WP7) is generalized in the CIM (WP3).

At implementation time, all personal data provided to the CIM is anonymous so no private data is managed at any moment. For instance, driving and ADAS related data is shared anonymously by the trial partners and coordinated with psychological data only by the research partners. If necessary, these data are shared back to applied partners only without personal key. Same approach is applied in the case of other private data (like car or energy production) if necessary.

In addition to data gathered from sensors and external sources, the proposed system developed in Electrific generates new data derived from collected data via self-learning techniques. Two major items are generated from past data collection:

1. A driving habits profile that characterizes the peculiarities of individual drivers
2. A travel profile that predicts times and routes which are likely to be taken.

In that sense, the University of Mannheim (UNIMA) commits to:

1. Use psychological behavior modeling tools

2. Increase the effect of advanced Electric Vehicle (EV) driver assistance services by making sure that the advice is presented in a way and using the incentives the given driver is most likely to respond to.
3. Use insights from behavioral economics and consumer psychology to build models for predicting the adherence to routing and charging suggestions on a basis of socio-demographic, usage based and psychological user profiles.
4. Allow to further increase this adherence by supporting ADAS suggestions with user-specific incentives and persuasion techniques.
5. Aim to further its understanding of how EV users can best be guided towards behavior patterns that are in their long-term interest and at the same time in the interest of grid-stability and sustainability.
6. Define a host of variables for a given user that should predict which guidance is most effective. I.e. users with strong pro-environmental values or those highly engaged in battery technology will profit most from corrections in their lay models of battery functioning and economic incentives. In contrast, impulsive and experientially driven users will react more strongly to social or comparative feedback.

Trial's partners commit to further investigate their theoretical understanding of how to guide EV user behavior by combining in depth psychological profiling with two classes of rewards, monetary and psychological:

1. Monetary incentives involve different charging tariffs and rewards and penalties for specific behaviors such as providing the ADAS with routing information.
2. Psychological rewards involve information about what other people do (social norms) and what one should do (e.g. in terms of "smilies" and "frownies" or in terms of appeals to sustainability goals).

III.3.3. WP1: Data protection risk management

In context of deliverable D10.2 Consortium partners performs initial risk identification and assessment using risk methodology, which is defined in D10.2. Focus was on identifying and assessing general data protection risks, and risks related to "Driver Information Model" and

"Psychological user profiling". Details in risk identification and assessment are defined in *"Sections III.3.3.b. and III.3.3.c.* Risk mitigation actions (plan) are explained in "*Section IV*.6".

III.3.3.a. Project risk management

Details on risk management are defined in project deliverable "D1.2 - Guidelines and Quality Assurance" which is available as of end of M3 in the project collaboration platform.

According to the definition of risk management in Electrific's Document of Action ("DoA, Section 3.2.3"), risk management will be done by implementing rules and procedures: Risks are identified regularly in each WP (e.g. WP meetings) and implementation of risk identification and assessment activities are done in each WP. Every WP leader is accountable for implementation and implementation of risk mitigation actions. Results of risk identification and assessment are reported by WP leaders to Project Coordinator on a monthly basis. Project risks assessment is performed during project management meetings (WP1).

Gfi, as the project coordinator ensures that risks are actively identified, analyzed and managed throughout the life of the project. Gfi as WP10 leader is also accountable as the risk manager for WP10. Risks concerning "Ethics requirements" are identified as early as possible in the project to minimize their impact.

All risks identified are assessed to identify the range of possible project outcomes. A qualification table ("*Section V.1. Appendix A*") is used to determine which risks are the top risks to pursue and respond to and which risks can be ignored.

The probability and impact of occurrence for each identified risk is assessed by the project manager, with input from the project team using the following approach:

Probability

- High – Greater than <70%> probability of occurrence
- Medium – Between <30%> and <70%> probability of occurrence
- Low – Below <30%> probability of occurrence

Each major risk (those falling in the Red & Yellow zones) is assigned to a project team member for monitoring purposes to ensure that the risk is not forgotten.

For each major risk, one of the following approaches is selected to address it:

- Avoid – eliminate the threat by eliminating the cause

- Mitigate – Identify ways to reduce the probability or the impact of the risk
- Accept – Nothing will be done

III.3.3.b. Risk identification

Following risks were identified in context of data protection[7]:

1. Data theft
    a. Description: Deliberate attacks on systems and individuals who have access to sensitive data can cause more harm than inadvertent exposure.
2. Data loss
    a. Description: Inadvertent exposure due to the loss of media. E.g. Backup tapes or paper files being misplaced on their way to a storage facility, or laptops left behind at airports or in taxis, are common ways data can end up in the hands of unauthorized people.
3. Neglecting data
    a. Description: When old computers or hard drives are sold or recycled, the information contained on them might be deleted, but if not properly erased, that data can be retrieved by anyone with just a few cheap tools. Additionally, leaving data on media that is not adequately protected with a strong password or with encryption leaves it vulnerable to a hacker or thief. The same applies to sensitive paper files, which should be disposed of using a cross-cut shredder or a recycling/trash pickup service that ensures proper disposal.
4. Improper data security, backup and deletion procedures/techniques applies
    a. Description: Collecting, storing, sending, encrypting, finding, and removing data may all have implications for its safety. Those who are handling sensitive data may find they are doing one or more of these activities. If proper safety precautions are not taken, inadvertent data exposure could be the result. For example, breaches of sensitive data stored in folders accessible via file sharing software have occurred more than once at some universities.

[7] MASSACHUSETTS INSTITUTE OF TECHNOLOGY, *What Are the Risks to Data?,* Information Systems and Technology: https://ist.mit.edu/security/data_risks

5. Extension of Driver Information Model that could include private data
    a. Description: In the current state of the project Consortium partners defined a high level Driver Information Model that will include anonymized and non-personal data. During information model development (WP3, WP5, WP7) it can happen that some data is included that could break rules defined in regards to data protection and anonymization.
6. Inclusion of private data in Psychological user profiling
    a. Description: In the current state of the project Consortium partners defined high level Psychological user profiling model that implies collection and processing of anonymized and non-personal data. During model development (WP6) it can happen that some data is included that could break rules defined in regards to data protection and anonymization.
7. Changes in legislation in the context of data protection
    a. Description: Regulation and legislation changes can occur that could affect actions Consortium partners committed to undertake during this project

III.3.3.c. Risk assessment

According to risk management guidelines in D1.2, following risk assessment is performed and following risk probabilities, impact and risk actions (approaches) are defined in this table:

Table 1. Risk probabilities, impact and actions.

	Data theft	Data loss	Neglecting data	Improper data security, backup and deletion procedures/techniques applies	Extension of Driver information Model that could include private data	Inclusion of private data in Psychological user profiling	Changes in legislation in context of data protection
Probability	Medium	Medium	Medium	Medium	Medium	Medium	Low
Impact	High	High	Medium	Medium	Medium	Medium	High
Action	Mitigate	Mitigate	Mitigate	Avoid	Avoid	Avoid	Accept

III.3.3.d. Qualification table for risk management

In the following table, number represent identification of the risk identified and risk asses in in sections III.3.3.b. and III.3.3.c. respectively. More information and details regarding risks and actions are explained in "*Section IV.6 – Risk Mitigation Actions*".

Table 2. Risk qualification by impact and probability.

Impact	High	*8*	*1, 2,*	
	Medium		*3, 4, 5, 6, 7,*	
	Low			
		L	M	H
	Probability			

III.4. Electrific's Self-Assessment conclusions

Electrific is a Research & Development project that involves data collection (and private data, as defined and elaborated in D10.1). This implies that we must ensure respect for people and for human dignity and fair distribution of the benefits and burden of research, and that we must protect the values, rights and interests of the research participant.

Core subject of the project is Electric mobility, and in that context some partners of the Consortium collect, manipulate and store personal data from customers, drivers, volunteers and/or fleet users.

The issues related to ethics within the project were categorized according to both self-assessments (*Section III.1. and Section III.2.).*

This scope of ethical relevance allowed us to detect the main stakeholders on POPD for Electrific and confirmed responsibilities and commitments for each of the partners.

Partners whose activities involves personal data collection are:

- E-WALD GmbH (E-WALD)
- E-Šumava cz s.r.o. (E-Šumava)
- University of Mannheim (UNIMA)

We define direct participation of humans as direct involvement in personal data collection and contact with human participants.

Other partners whose activities involves an important responsibility regarding data protection are:

- Deggendorf Institute of Technology (THD)
- Czech Technical University in Prague (CVUT)

Even if the THD doesn't collect personal data directly from participants, WP5 has the greatest impact on data privacy and therefore also the greatest need for security mechanisms since the data to be collected for the Car Information Model features different types (EV-related data such as Building Management System (BMS) information, vehicle speed, geo location information as well as sensitive user-related data such as IDs, schedules, contacts, etc.) which alone or in combination potentially can be exploited not only to uniquely identify an EV user but only to generate complete movement profiles which allows conclusions about personal habits and proclivities. Special emphasis has to be put on the appropriation of gathered individual-related data. Information such as the daily schedule with timing constraints as well as further information about the driving habits of the EV user is needed and valuable for the CIM. However, personalized data flows will be as short as possible and the transmission will be secured appropriate. Personalized data will be anonymized for instance by abstraction or classification of user profiles wherever possible.

At this stage of the project, CVUT believes that the best technologically approach would be not to use the proposed centralized solution (a server), but to run the system in a distributive way regarding the personal devices of the persons, or the on-board computers of the cars with some privacy that preserves distributed algorithms. In such architecture, there would not even exist a single point of failure and all the personal data including the user models, car models, etc. would be only on the particular devices of the particular people.

Finally, for this deliverable 10.2 Agència D'Ecologia Urbana de Barcelona (BCNecologia) is not concerned due that, they don't collect personal data, so any data storage, data retention, data anonymization and data destruction is expected. They are not directly the operators of the EVs systems, so companies will give them data already anonymized.

IV. ELECTRIFIC'S ETHICS REQUIREMENTS AND ACTIONS IN REGARDS TO PROTECTION OF PERSONAL DATA

During planning and initial analysis phase, it is anticipated that a considerable amount of data will be collected, and generated information is stored and analyzed using Big Data technologies. To this regard, Consortium partners are committed to guarantee POPD.

Besides what Consortium partners defined in "D10.1" regarding research with human participation, partners comply with several other requirements about data protection such as:

- Applying POPD to natural persons (customers and/or volunteers), whatever their nationality or place of residence, in relation to the processing of their personal data
- Accepting that in order to prevent creating a serious risk of circumvention, the protection of natural persons should be technologically neutral and should not depend on the techniques used
- Following the data protection processes described below for every stage of the data analysis value chain

IV.1. Requirements for Personal Data Collection

Besides what Consortium partners defined in "D10.1", trial's partners comply with:

1. Not collecting data regarding racial or ethnic origin
2. Not doing any type of research involving children (or other persons unable to give consent)
3. Not transferring data neither to external European Union (EU) countries nor to third countries

In regards to tracking and/or observation of participants, the UNIMA commits to:

1. Respect the proportionality principle described above in "*Section II.1.2.a*"
2. Elaborate and implement anonymized surveys or interviews respecting processes described in "*D10.1, Section IV.2.1.e*".
3. Transcript interviews immediately when they are done in paper format
4. Encrypt interviews already transcript

5. Collect data with a German server, which adheres to German data protection regulation[8], when surveys are done online
6. Anonymize data following the procedure described in "*D10.1. Section IV.2.3*"
7. Receive data from experimentation trials already anonymized by trial partners
8. Engaged to conduct trial's data analyses in the same manner as for the data of surveys and interviews described in "*D 10.1. Section IV.2.1.e*".

IV.2. Requirements for Personal Data Storage

Partners who manage personal data and are faced to deal with data protection processing commit to implement the tools described below:

E-Šumava commits to:

1. Store data in original paper form filled in by customers
2. Locate data after into a computer database for consecutive processing
3. Back-up encrypted database up to a cloud on Internet every day
4. Define a secured access policy: Administration staff of E-Šumava has read and write access to the data. Modify and delete operations are not allowed. IT specialist has access to encrypted database only, not to individual records

E-WALD complies with:

1. Store data in paper form in their office rooms and online at an extern company, the same one that provides the booking software
2. Define a secured access policy: Only qualified customer advisers and key account managers from their company have access to data. Additionally, their distribution agencies are allowed (and able) to read the user data when they activate users for the first time

THD commits to:

1. Store data on hard disks protected and administrated by THD's central IT services. More precisely, data is stored in a VMWare server which is connected to the DIT network only by Ethernet (no Wi-Fi, Bluetooth or USB)

[8] http://www.gesetze-im-internet.de/englisch_bdsg/

2. Back-up the server once a day and store on another storage system in another building. The SQL data is backed up once a day and stored on a separate storage system
3. Define a secured access policy: Server administrator (full access to data), scientific officers (read access to data), service accounts (write access to data)

In regards to tracking and/or observation of participants, the UNIMA commits to:

1. Store paper files, once interviews are transcript in locked offices at the University
2. Store encrypted transcripts on USB drives.

IV.3. Requirements for Personal Data Anonymization

Concerning anonymization procedure for trial's partners and the UNIMA, detailed information is provided in "*D.10.1 - Section IV.2.3*".

Otherwise, THD commits to follow a generalization process to anonymize personal data, as described below:

1. Collect data
2. Structure data
3. Omit user profile data that can be directly linked to a certain person (name, surname, etc.)
4. Link the edited profile to a project number (e.g. user Michael A. etc. is number #A0161)
5. Only the project number is used in terms of data evaluation (Driving behavior, charging behavior etc.)

IV.4. Requirements for Personal Data Retention and Destruction

As defined in EU Data Protection Directive[9] "a data subject should have the right to have his or her personal data erased and no longer processed where the personal data are no longer necessary in relation to the purposes for which they are collected or otherwise processed, where

[9] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)

a data subject has withdrawn his or her consent or objects to the processing of personal data concerning him or her, or where the processing of his or her personal data does not otherwise comply with this Regulation".

In that sense, as described in EU Data Protection Directive, storage periods have to be defined in every project. So, when all purposes of the project are fulfilled:

1. E-Šumava commits to delete all data after 3 years from USB drives.
2. E-WALD commits to destroy all data after it is not needed anymore for the project.
3. THD commits to store data on the server for further evaluations. The data will be deleted after 10 years in accordance with the recommendations for good scientific practice of the Deutsche Forschungsgemeinschaft (DFG)[10].

In regards to tracking or observation of participants, the UNIMA commits to:

1. Destroy USB drives after 5 years
2. Delete data immediately from the survey's online environment[11] after data collection is completed.

IV.5. Actions to guarantee data publicity and availability

In Electrific project, the topics of e-mobility, energy management systems, battery storage and optimization in terms of renewable energy usage and EV route planning, as well as grid friendliness are addressed. Therefore, dissemination activities focus around these scientific fields and address specific target groups and metric accordingly, for a continuously updated dissemination plan is implemented. Not all target groups can be addressed in the same manner.

Nevertheless, consortium can already confirm the different dissemination channels that are set up.

1. A website with the description of the project, the partners and the objectives

   The website enables the public to give feedback, and interact with staff members of the Consortium. It is regularly updated and maintained to present Electrific to an international

[10] http://www.dfg.de/en/research_funding/principles_dfg_funding/good_scientific_practice/index.html

[11] http://www.soscisurvey.de

audience. All partners promote the project on their website, generating traffic to the Electrific website. This enables coverage of all target groups.

2. Novel dissemination channels

   In this regard, Consortium partners engage in all kinds of public events like science slams or be actively involved as representatives of Electrific in social networks like Twitter, LinkedIn, or Research Gate. Targeting general public, Consortium partners create a page for the project in an electronic encyclopedia (i.e. Wikipedia) in different languages. This channels help to promote the project progress and results in the broader public, especially the young generation students and professionals.

3. Press releases

   The press releases target printed media and online articles. Blog entries on Electrific home page can be taken into account as a special type of online articles. The progress and success are measured by the numbers of published press releases and online articles. The Consortium aims to publish up to 15 press releases and online articles.

4. Brochures and posters

   One brochure and one poster is created and updated over the project's duration. They highlight the progress and achieved results of the project in industrial, academic, and also internal events.

5. A project related video

   In a previous project, University of Passau (UNI PASSAU) produced a project related video. Using the acquired experience and its professional equipment, UNI PASSAU leads the production of a video for this new project. That video helps to communicate key ideas of the project and raise awareness and interest of the developed strategies for all kinds of stakeholders.

6. Publication activities

   The number of accepted papers is a first indicator besides the quality of the different publishers and events (e.g. journals, conferences and workshops). High ranked international scientific journals, among others, are preferred. But also workshops and conferences as well as edited books and book chapters belong to this category. The progress and success are measured by the number of accepted scientific publications. The goal is to have at least three fully peer reviewed journal papers and 10 additional fully

peer reviewed scientific publications (both conference and workshop), e.g. at e-Energy, EFIP sustainIT, D-A-C-H Energieinformatik (energy computer science), JSAC, IEEE Trans. on Smart Grid and IEEE Intelligent Transportation Systems.

7. Community building activities

   The Consortium partners actively participate to the strengthening of the Electric Vehicles community (focused more on target group C). Besides taking active part in clustering and liaison events, project promotes community work via service platforms and ecosystems for the Electric Vehicles sector. Project also establishes synergies with project clusters in the sector. European Associations and other European initiatives: The European Association for Battery, Hybrid and Fuel Cell Electric Vehicles (AVERE), European Council for Automotive R&D (EUCAR), European Automobile Manufacturers Association (ACEA), Electric Drive Transportation Association (EDTA), Association of European Cities interested in Electric Vehicles (CITELEC), The European Green Vehicles Initiative (EGVI), etc.

8. Industrial events and exhibitions

   These are related to the transfer of knowledge and results from Technology Readiness Level[12] 4/5 to – at least – 6[13] and fit well into the exploitation strategies of industrial partners, targeting the future adopters and industry stakeholders e.g. European Electric Vehicle Congress, EGVI workshops, EUROBAT events, EUSEW events, MOBI events and seminars, European Battery, Hybrid and Fuel Cell Electric Vehicle Congress, Energy Solutions for Smart Cities and Communities, Sustainable Energy Policy and Strategies for Europe.

9. Academic events

   This awareness has also potential to reach industrial target groups. The participation in the following major conferences and journals is anticipated: IEEE Transaction on Smart Grid, ACM e-Energy, and JSAC. The objective is to deliver eight additional active contributions

[12] COSMOS, Are you familiar with the Technology Readiness Levels?, http://ncp-space.net/are-you-familiar-with-the-technology-readiness-levels/

[13] EC, Technology readiness level descriptions, https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

besides the presentation of fully peer reviewed publications in academic events. Project Consortium partners work at creating research communities (e.g. task forces, working groups) for methodologies, standards and technologies, and results developed and obtained during the project. In order to foster collaborations with other projects, synergies are identified.

10. Workshops

    Some of the Consortium partners jointly organized the highly successful E²DC ("Energy efficient Data Centers") workshop series in the past years. For the new project, a comparable scientific workshop is planned, focusing on topics like e-mobility, intelligent use of renewables for charging, battery storage systems and smart grids. Partners involved in this workshop may be UNIMA, Gfi, UNI PASSAU and THD.

    For the general public Consortium partners organize a one-day workshop (exhibition) where the people can try driving an e-vehicle and attained a short talk about the e-vehicle. THD and E-WALD are experienced in running events to the public. Both are able and willing to provide some of the vehicles planned for the trails for public events in Bavaria. Other contributors could be CVUT, Freemind, UNIMA, UNI PASSAU, Bayerwerk, etc.

    For the general public, possible early adopters and domain experts another workshop is organized in Barcelona. With BCNecologia as leader, industrial partners (Freemind, Gfi, Has.to.be) with the support of scientific ones (UNIMA, UNI PASSAU, CVUT, THD), exhibit the results of the experiments and trials executed in Barcelona - for public transport services - and in Bavaria - for EV fleet management – in a market-adoption oriented way. A booth showing demos and interactive tools is expected for this workshop.

11. University education immerses with research findings from the academic partners of the Consortium partners

    Devised methodologies and the insights gained during the project is promoted to the students by means of new lecture and seminar units, as well as B.Sc., M.Sc. and PhD theses. To this regard THD offers 6 topics for B.Sc./M.Sc. theses in the context of (1) EV battery modeling and (2) privacy and security. It plans to create 3-4 new units to be integrated in existing courses of (1) EV data modeling and (2) security management. CVUT proposes 10 topics for B.Sc./M.Sc. theses, 6 seminars and some new lecture units in the field of multi-criteria electro mobility optimization. UNIMA offers 8 topics for B.Sc./M.Sc. theses in the field of business Requirements and decision making policies. UNI PASSAU

(University of Passau) proposes 10 topics for B.Sc./M.Sc. theses for intelligent EV energy management (e.g. charging algorithms) and energy storage (e.g. batteries) systems. Results are used to improve the existing lecture and seminars.

Regarding research done by the UNIMA, they confirm that:

a. Data is published in peer-reviewed journals, with access given to data sets which only consist of numerical data and no identification of participants as individuals will be possible.

b. Reports in the journals are made on the base of averages across all participants or subgroups of participants. (Please refer to "*Section V.1. Appendix B"* for a list of example papers about how quantitative data can be presented in publications).

12. Open access

Removing legal, commercial and technological barriers to access scientific information, the research process becomes more efficient and the research results more visible. open access prevents duplication, fosters knowledge and technological transfer and promotes innovation. To address limited access to scholarly outputs, the project Consortium publishes all not confidential material and publications under the terms of open access. In case of confidential material, the research data is made available in an anonymized way. The scientific publisher immediately provides all articles in open access mode. Additionally, self-archiving is performed. Published articles or final peer-reviewed papers are provided on the project website. Additionally, authors publish their scholarship or in open access journals to make the publications freely available to end users. Furthermore, the Consortium commits to produce non-confidential open data in order to foster collaborations with other researchers. The produced data is available to European Union Open Data portal.

IV.6. Risk mitigation actions

In order to reduce risks probability and impact, the following risk mitigation actions are to be implemented:

1. Data theft: Assure that appropriate instructions for equipment protection, data manipulation and dissemination is prepared and distributed to all Consortium members. In case of theft, police/legal authorities should be notified. Records and all official information must be kept for administrative and legal purposes.

2. Data loss: Processes and regulations should be implied by the Consortium partners in order to regulate data storage and data medium protection that ensure safe location and storage of the data. In case of data loss, if applicable, police/legal authorities should be notified. Records and all official information must be kept for administrative and legal purposes.
3. Neglecting data: Include appropriate procedures for complete and safe data erasing from reusable and disposable equipment.
4. Improper data security, backup and deletion procedures/techniques applies: Reassess implemented actions and implement appropriate ones.
5. Insecure practices: Implement secure practices to fill gaps in security context.
6. Extension of Driver Information Model that could include private data: Analyze model extension during each iteration. Each new data flow path and component should be reassessed in regards to ethics issues.
7. Inclusion of private data in Psychological user profiling: Analyze survey model extension during each iteration. Each new data flow path and component should be reassessed in regards to ethics issues.
8. Changes in legislation in context of data protection: Each change in the legislation in context of ethics requirements must reflect to baselines defined in D10.1 and D10.2. Changes are implemented, and ethics issues actions are aligned to new changes.

IV.7. Electrific's general procedure for Ethics requirements in regards to data protection

This section describes general procedure that needs to be followed during each activity performed by every Consortium partner in regards to Ethics requirements and data protection.

Procedure is described with following steps:

1. Every Consortium partner continuously consults the content of Ethics requirements document D10.1 and D10.2. The goal of this step is that every Consortium partner is fully aware and respects the content and obligations described in this document
2. During each activity and/or creation of delivery in the Electrific project, every accountable Consortium partner execute the following tasks:

a. Performs analysis of the action and/or delivery content in regards to ethics issues of data protection

b. For Protection Data requirements, the Consortium partner consults Section IV.

c. In case the Consortium partner finds change in delivery in regards to preliminary assumptions based on analysis and/or requirements defined in this document (e.g. new storage or anonymization procedure), Consortium partner performs alignment actions that bring delivery content in line with ethics requirements

3. The accountable Consortium partner implements the Ethics requirements section that will support enablement of continuous monitoring Ethics requirements fulfillment. Details of this task are described in "*Section IV.1.7*.".

4. If additional data or explanation is required in regards to Ethics requirements, the Consortium partner consults with the WP leader and/or project coordinator respectively

IV.8. Continuous monitoring of Ethics requirements fulfillment in regards to Protection of Personal Data

This chapter describes actions and obligations in respect of continuous monitoring of Ethics requirements in regards to POPD.

These steps are continuously made during lifetime of the project:

1. Continuous Ethics requirements legal and regulation framework monitoring

2. In case of legal / regulation change, the project coordinator and project management board must be informed in written form in earliest convenience

3. The project coordinator is accountable to confirm legal and regulation changes, and to include / amended these changes to document D10.1 and D10.2

4. As described in the *Section* ***Error! Reference source not found.***, during each activity and/or delivery creation, the accountable Consortium partner includes Ethics requirements section which include:

   a. Description of applicable ethics issues

   b. Description of the ethics issues actions implemented

c. Description of differences in regards to main Ethics requirements document with complete and justified explanation must be provided

d. Any ethics issue implementation change takes all general ethics Requirements ("*Section II*") and Electrific Requirements ("*Section IV*") in account

5. As described in *"D.10.1.-Section IV.3",* Project constitutes Ethics Advisory Board that ensures independent and expert Ethics requirements review on regular basis
6. Each consortium partner provides all information required to perform ethics requirement audit
7. Monthly risk identification, assessment and risk mitigation plan is performed

IV.9. Non-disclosure of information

In this project context, due to the fact that there is an exchange of valuable information among partners', confidentiality issues and measures should be taken into consideration. In the Consortium Agreement, Section 10, the Consortium partners agreed on Non-Disclosure (NDA) of Information collected within the Project scope. In case of inclusion of external parties (that may contribute to the achieve the project goal – e.g. parties contributing to the trial in Barcelona – described in D8.1) or any case where possible share of project data could occur Consortium partners commit to sign non-disclosure agreement to ensure data protection in project scope. Therefore, signature of a non-disclosure agreement (NDA) ("*D.10.1. Section V.1. - Appendix A*") will take place in each of the above described occasions. This action will represent the Consortium's compliance with confidentiality obligations during the whole life of the project and after.

V. APPENDICES

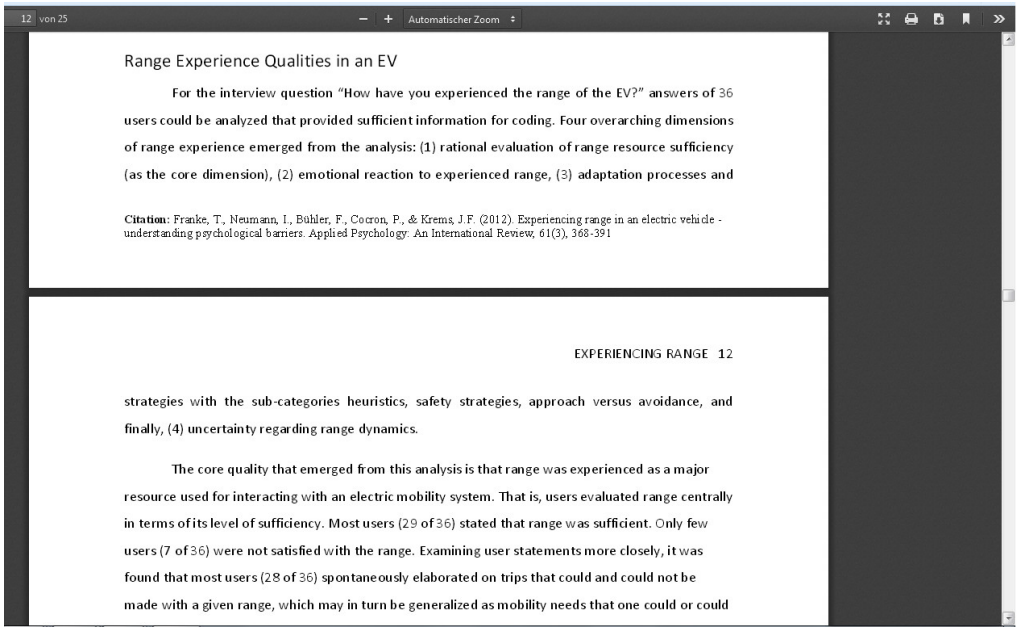
V.1. Appendix A: Qualification table for Risk Mitigation Plan

Table 3. Qualification table for Risk Mitigation Plan.

Impact	High			
	Medium			
	Low			
		L	M	H
	Probability			

V.2. Appendix B: UNIMA's example papers about how quantitative data can be presented in publications

Example of one possible presentation of results in a section of a qualitative study made by Franke et al. (2012)



12 von 25 Automatischer Zoom

Range Experience Qualities in an EV

For the interview question "How have you experienced the range of the EV?" answers of 36 users could be analyzed that provided sufficient information for coding. Four overarching dimensions of range experience emerged from the analysis: (1) rational evaluation of range resource sufficiency (as the core dimension), (2) emotional reaction to experienced range, (3) adaptation processes and

Citation: Franke, T., Neumann, I., Bühler, F., Cocron, P., & Krems, J.F. (2012). Experiencing range in an electric vehicle - understanding psychological barriers. Applied Psychology: An International Review, 61(3), 368-391

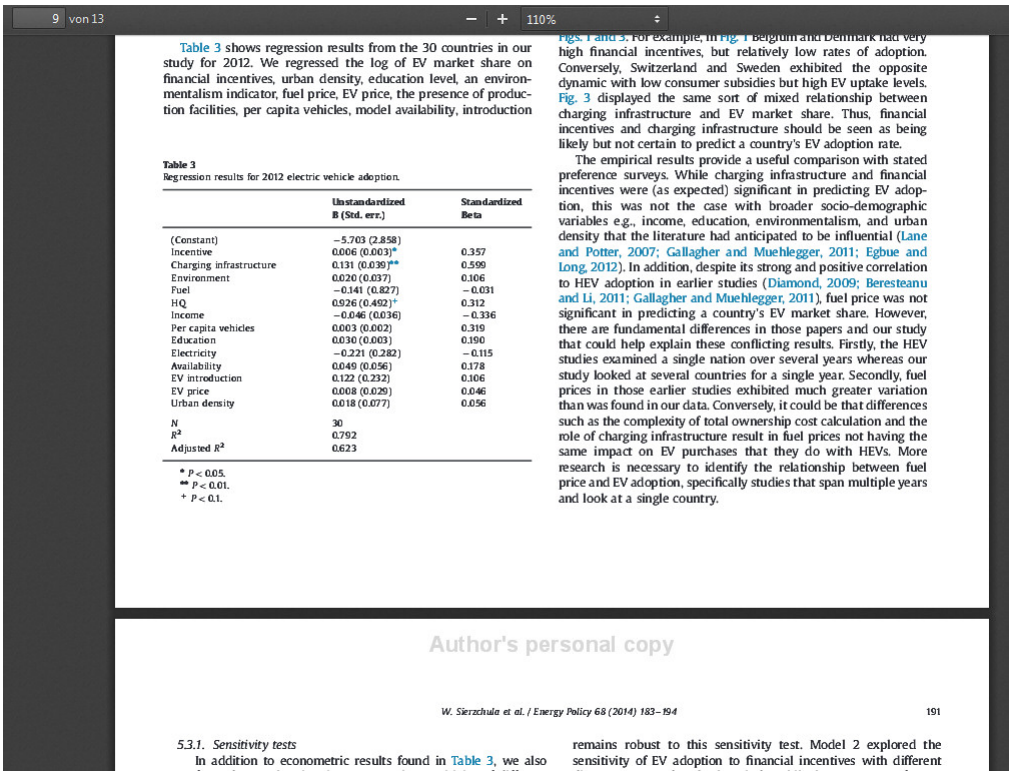
EXPERIENCING RANGE 12

strategies with the sub-categories heuristics, safety strategies, approach versus avoidance, and finally, (4) uncertainty regarding range dynamics.

The core quality that emerged from this analysis is that range was experienced as a major resource used for interacting with an electric mobility system. That is, users evaluated range centrally in terms of its level of sufficiency. Most users (29 of 36) stated that range was sufficient. Only few users (7 of 36) were not satisfied with the range. Examining user statements more closely, it was found that most users (28 of 36) spontaneously elaborated on trips that could and could not be made with a given range, which may in turn be generalized as mobility needs that one could or could

Figure 2. Example papers about how quantitative data can be presented in publication – part 1.

Example of one possible presentation of quantitative results in a section of a quantitative study by Sierzchula et al. (2014)



9 von 13 110%

Table 3 shows regression results from the 30 countries in our study for 2012. We regressed the log of EV market share on financial incentives, urban density, education level, an environmentalism indicator, fuel price, EV price, the presence of production facilities, per capita vehicles, model availability, introduction

Table 3
Regression results for 2012 electric vehicle adoption.

	Unstandardized B (Std. err.)	Standardized Beta
(Constant)	−5.703 (2.858)	
Incentive	0.006 (0.003)*	0.357
Charging infrastructure	0.131 (0.039)**	0.599
Environment	0.020 (0.037)	0.106
Fuel	−0.141 (0.827)	−0.031
HQ	0.926 (0.492)+	0.312
Income	−0.046 (0.036)	−0.336
Per capita vehicles	0.003 (0.002)	0.319
Education	0.030 (0.003)	0.190
Electricity	−0.221 (0.282)	−0.115
Availability	0.049 (0.056)	0.178
EV introduction	0.122 (0.232)	0.106
EV price	0.008 (0.029)	0.046
Urban density	0.018 (0.077)	0.056
N	30	
R^2	0.792	
Adjusted R^2	0.623	

* $P < 0.05$.
** $P < 0.01$.
+ $P < 0.1$.

Figs. 1 and 3. For example, in Fig. 1 Belgium and Denmark had very high financial incentives, but relatively low rates of adoption. Conversely, Switzerland and Sweden exhibited the opposite dynamic with low consumer subsidies but high EV uptake levels. Fig. 3 displayed the same sort of mixed relationship between charging infrastructure and EV market share. Thus, financial incentives and charging infrastructure should be seen as being likely but not certain to predict a country's EV adoption rate.

The empirical results provide a useful comparison with stated preference surveys. While charging infrastructure and financial incentives were (as expected) significant in predicting EV adoption, this was not the case with broader socio-demographic variables e.g., income, education, environmentalism, and urban density that the literature had anticipated to be influential (Lane and Potter, 2007; Gallagher and Muehlegger, 2011; Egbue and Long, 2012). In addition, despite its strong and positive correlation to HEV adoption in earlier studies (Diamond, 2009; Beresteanu and Li, 2011; Gallagher and Muehlegger, 2011), fuel price was not significant in predicting a country's EV market share. However, there are fundamental differences in those papers and our study that could help explain these conflicting results. Firstly, the HEV studies examined a single nation over several years whereas our study looked at several countries for a single year. Secondly, fuel prices in those earlier studies exhibited much greater variation than was found in our data. Conversely, it could be that differences such as the complexity of total ownership cost calculation and the role of charging infrastructure result in fuel prices not having the same impact on EV purchases that they do with HEVs. More research is necessary to identify the relationship between fuel price and EV adoption, specifically studies that span multiple years and look at a single country.

5.3.1. Sensitivity tests

In addition to econometric results found in Table 3, we also remains robust to this sensitivity test. Model 2 explored the sensitivity of EV adoption to financial incentives with different

Figure 3. Example papers about how quantitative data can be presented in publication – part 2.

List of quantitative data publications from UNIMA authors and others (one screenshot is provided)

- Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. Energy policy, 48, 717-729.
- Sierzchula, W., Bakker, S., Maat, K., & van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. Energy Policy, 68, 183-194.
- Vetter, M., & Kutzner, F. (2016). Nudge me if you can-how defaults and attitude strength interact to change behaviour. Comprehensive Results in Social Psychology, 1-27.

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electrific