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Generating recommendations on empirical methods for transport planning practice and administration: The German Approach

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Abstract

Empirical data are crucial for transport planning, supporting decisions on infrastructure, services, and revenue sharing. Stakeholders, including government administrations and public transport operators, collect travel behavior data through surveys, traffic counts, and observations. Reliable and transparent data are essential for robust planning, ensuring reproducibility, and a careful use of public resources. Recent advancements in transport surveys involve new electronic data collection methods, such as smartphone apps and increased computing power. These developments introduce new stakeholders and data sources (e.g., mobile phone data), sparking discussions on their accuracy, reliability, and approximation to actual transport behavior. The rapid evolution in empirical methods poses challenges for transport planners to keep track with state-of-the-art methodologies. The German Road and Transportation Research Association (FGSV) strives the knowledge transfer from academia into transport planning practice. The "Recommendation for Empirical Methods in Transport" (EVE), published in 2012, serves as a guideline for transport surveys in Germany. It covers statistical sampling, extrapolation methods, traffic counts, behavioral observations, qualitative surveys, and data protection issues. Given the significant advancements in empirical methods since 2012, the EVE is currently under revision. A key challenge in the revision process is determining which traditional and new methods should be recommended, as these guidelines will shape transport planning for years. This paper discusses the planned structure and content of the revised EVE, addressing new empirical methods such as tracking, participatory approaches, and data protection. Feedback from the ISCTSC community is highly appreciated to incorporate global best practices.

Keywords: Recommendations, travel survey, practitioners, EVE, empirical methods, data protection, knowledge transfer

1. Introduction

Empirical data are of central importance to transport planning practice and administration. Administrations of cities, municipalities, and countries, as well as public transport operators are examples of stakeholders who regularly survey information on travel behavioral patterns of the population. They also carry out traffic counts and other observations to understand how transport demand is developing in their planning areas. This data is key for essential transport planning tasks such as decisions on future transport infrastructure, transport services, and revenue sharing in public transport. Furthermore, the collected information is an essential component of transport models and the prediction of future transport demand. Therefore, empirical data need to be reliable and robust. As most planning tasks and resulting decisions affect the population and are financed by public resources, making transparency, reproducibility, and data availability for evaluations and further analyses critical.

Recently, an active and growing field of transport surveys and methods has emerged, including new methods of electronic data collection and observation, e.g., via smartphone apps, and increased computing resources, whereby both issues go hand in hand. As a result, new market players are emerging (e.g., companies that provide apps for tracking). Other players use existing data from new sources (e.g., cell phones) to calculate and map traffic demand. This development results in uncertainties and a constant discussion of the advantages and disadvantages

of emerging data sources and methods in terms of new insights and an approximation to the "ground truth" of actual transport situations and behaviour.

Due to the rapid development in this field, it is challenging for transport planning practitioners to keep track with the current state of art on empirical methods for transport planning. Fostering knowledge transfer from academia to practitioners and providing overviews of new developments is a central goal of the German Road and Transportation Research Association (Forschungsgesellschaft für Straßen- und Verkehrswesen e. V., FGSV). The most recent FGSV publication on transport surveys, the “Recommendation for Empirical Methods in Transport” (in German: Empfehlung für Verkehrserhebungen EVE) is a standard guide for transportation planning practice in Germany and was published in 2012. In its current form, the EVE (2012) focuses on empirical data and surveys in passenger transport and also partly includes commercial transport. Readers of the EVE (2012) receive comprehensive and basic knowledge on transport survey methods; e.g., statistical principles on sampling and extrapolation methods, counting, measurement, observation, behavioural reactions in terms of real and hypothetical behaviour as well as on qualitative survey procedures and data protection issues. Due to many changes in the field of empirical methods in transport since 2012, the EVE is currently being revised.

The remainder of the paper is organized as follows: Chapter 2 is a retrospective of the history and background of EVE 2012. Chapter 3 focuses on the current revision of the EVE and discusses guiding principles and key challenges of the revision. In Chapter 4, we outline our interest in exchanging views with international experts at the ISCTSC on transfer paths on transport survey methods from academia into transport planning practices. Feedback from the international community is highly appreciated to learn from new methods and similar guidelines around the globe. A brief summary follows in Chapter 5.

2. History and background of the EVE 2012

Due to the rapid development in this field, it is challenging for transport planning practitioners to keep an overview on empirical methods for transport planning. Fostering knowledge transfer from academia to practitioners and providing overviews of new developments is a central goal of the German Road and Transportation Research Association (Forschungsgesellschaft für Straßen- und Verkehrswesen e. V., FGSV). The FGSV is a non-profit technical and scientific association that was founded in 1924. The FGSV releases technical standards and specifications that apply to the entire German road and transport community and system (FGSV, 2024) and provides recommendations on specific topics, including EVE. In the FGSV, representatives from science, industry, administration, and engineering work on a voluntary basis. Figure 1 illustrates the organizational structure of the FGSV.

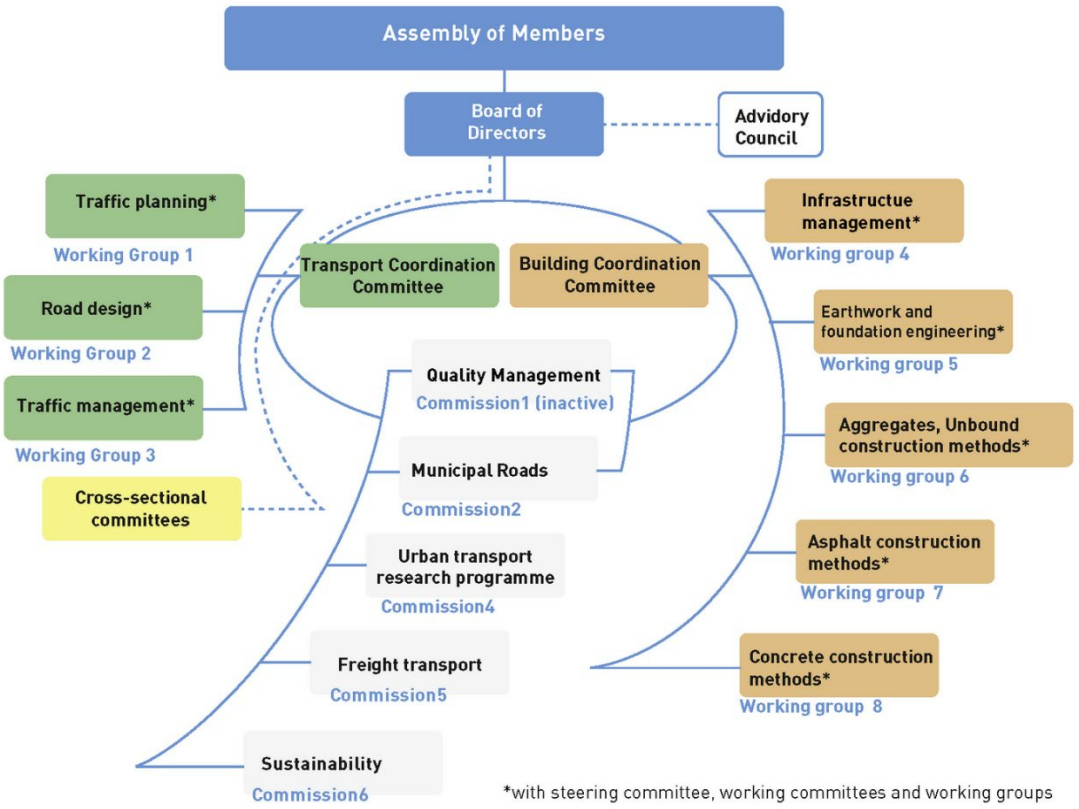

Figure 1: FGSV organizational structure (source: FGSV, 2025)

FGSV standards as well as FGSV recommendations are jointly written by FGSV working groups and then discussed and published by FGSV committees. An engagement on FGSV working groups is on a voluntary basis; there is no traditional project funding. As a rough guide, the working groups meet twice a year and discuss interim results. When a document is considered to be complete by the working group, it is discussed in higher committees and panels, which are responsible for publication. This approach by the FGSV has both positive and negative effects. One positive aspect, without doubt, is that the consideration and discussion in various committees ensures that many different perspectives on a topic are taken into account, thus creating a comprehensive document. On the other hand, the fact that the drafting is done on a voluntary basis, on the one hand, and the extensive coordination in the committees, on the other, results in the creation of a recommendation or guideline tis a long working process and stretches over years. For example, the former working group for the creation of EVE 2012 started its work in 2008, but the EVE was only published in 2012. The EVE2012 working group had 15 members.

The Recommendation for Empirical Methods in Transport (EVE) looks back on a somehow long tradition of publications in this field. The latest version was published in 2012. Previous versions date back to 1991, the first version of the EVE, and to 1986 a fact sheet on transport surveys and issues of data protection (Merkblatt über Verkehrserhebungen und Datenschutz).

The EVE focuses on active data collection methods, which are relevant for transport planning. These methods are explained as succinctly as possible in generally comprehensible language. Consequently, forms of passive data collection, in particular big data (e.g., floating phone data, floating car data) are not part of the EVE. These topics are discussed in other FGSV working groups, where recommendations for the handling of big data in transport in practice and in administration are also being developed.

The latest publication of the EVE from 2012 contains of nine chapters and, including the appendix, covers 135 pages. The first chapter provides an introduction to the topic, while the second chapter briefly explains the essential statistical principles of surveys. This is followed by six chapters in which different types of empirical methods are presented (see Figure 2). Chapter 9 addresses the challenges of data protection in surveys.

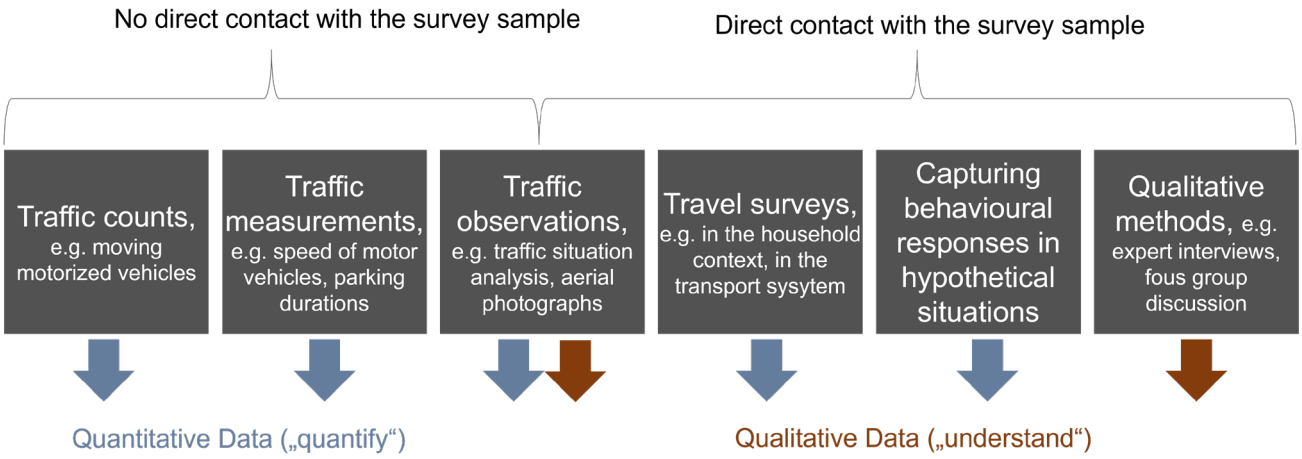

Figure 2: Empirical methods in transport in EVE2012 (own illustration, based on FGSV 2012)

The empirical methods shown in Fig. 2 are briefly introduced in the following bulleted lists (see FGSV 2012):

- Traffic counts are measure quantitatively ascertainable movements of people and/or vehicles on transport routes in a planning area. Counts provide information about the spatial and temporal distribution of traffic volumes and flows.
- Traffic measurements are used to record characteristics that can take on continuous values (e.g., speeds). They serve primarily as a basis for assessing the quality of the traffic flow.
- Traffic observations serve to record external characteristics and visible behaviours in street space. Observation procedures usually focus on visual perception.
- Travel surveys provide mobility indicators and information on behavioural patterns in transport. When conducting surveys, the general circumstances of travel behaviour and, if necessary, the decision-making process can be explicitly recorded.
- Surveys on hypothetical situations, respondents must react to a selection of possible, perhaps future, scenarios.
- Qualitative methods gain knowledge on motivations, attitudes and the cognitive background of behaviour. In addition, they are employed to survey expert knowledge and, in group discussions, observe how people discus and (dis)agree on joint positions.

Figure 3 outlines the structured process of empirical methods aimed at minimizing bias as much as possible. It begins with basic conceptualization, where method design, target population, and communication methods are established. This is followed by the preparation and organization of the empirical method, and then the implementation of data collection. After data collection, data preparation and analysis take place to ensure data quality and reliability. Finally, documentation is created, detailing the data structure and, if applicable, the provision of data. This systematic approach ensures that each phase of the empirical method is carefully planned and executed to provide reliable and unbiased results for transport planning. The structure of the respective chapters on empirical methods largely follows the structure shown in Figure 3.

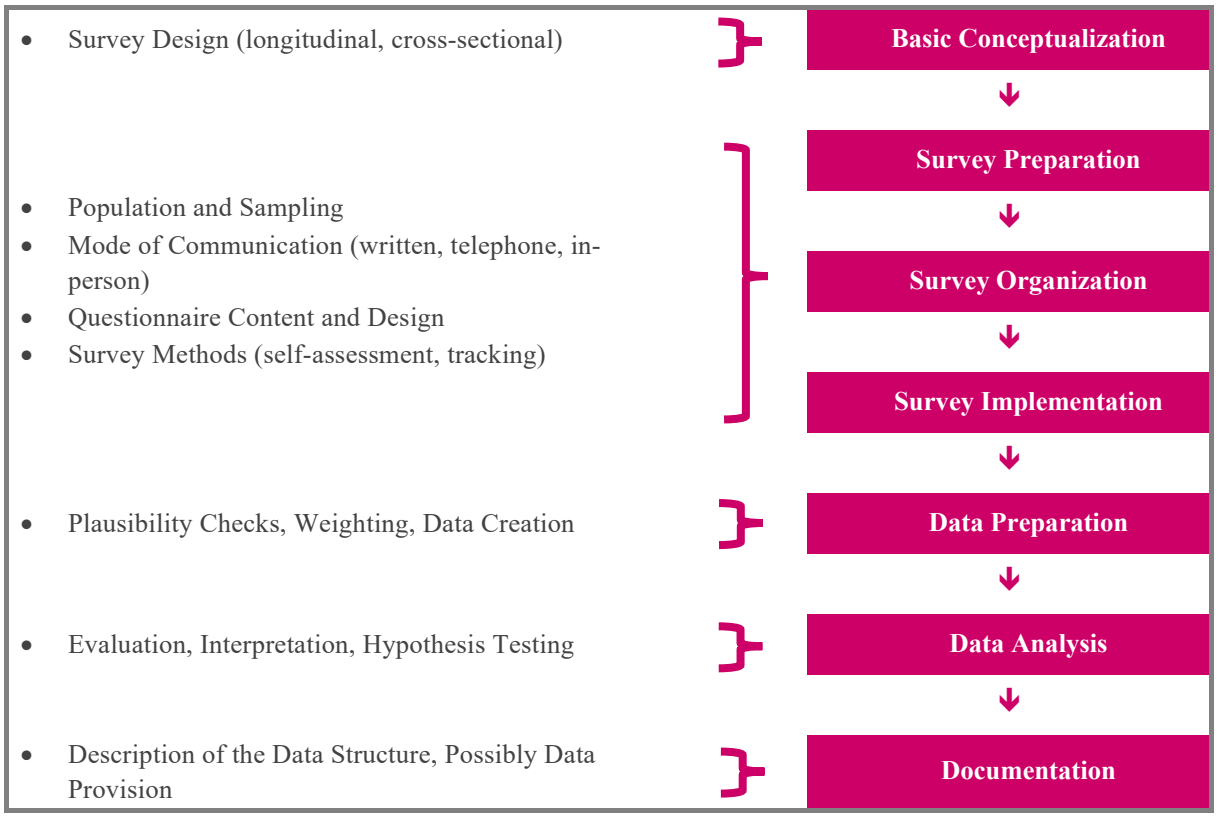

Figure 3: Chapter Structure: Main Chapters and Subchapters of EVE 2012 (source: FGSV, 2025)

3. Current revision of the EVE

In 2022, FGSV decided that an EVE update is needed to describe the latest developments and technological advancements in transportation. Addressing this goal was delegated to a working committee, which started the work in March 2024 and includes 32 members currently. All of these members contribute their expertise voluntarily, whereby 23 members work in academia, 5 in commercial offices, and 4 in civil services. The number of working group members has more than doubled compared to EVE2012. This also underlines the growing relevance and heterogeneity of travel surveys. Guiding principles and key challenges of the EVE revision are discussed in the following paragraphs.

3.1. Guiding principles of the EVE revision

Three essential auditing principles are incumbent upon the EVE revision.

First, the structure of EVE 2012 has proven itself in terms of manageability for practitioners. The creation process at the time also shows that broad compromises have already been found in many structuring aspects. The revision can be built on this, and it is particularly important to critically examine the chapter structure adjustment to see if changes bring the hoped-for added value. Consequently, as little as possible and only as much as necessary should be changed in the revision process compared to EVE 2012.

Second, it is assumed, that once the revised EVE is published, this document will serve as a foundation for transport survey for one or two decades. Consequently, the content should be presented in such a way that it remains valid for as long as possible.

Third, the revised EVE, like the EVE2012, will be employed on legal disputes. Therefore, the procedures of the empirical methods described in the EVE must be completely and unambiguously documented so that it can be referred to in legal proceedings if necessary.

3.2. Key challenges of the EVE revision

The revision of the "Recommendation for Empirical Methods in Transport" (EVE) presents several key challenges due to rapid advancements in data collection methods, emerging technologies, and evolving transport planning needs. The following aspects are central to ensuring the revised guideline remains relevant, robust, and applicable for future transport planning practice:

1. **Integration of new data sources and methods:** Recently, an active and growing field of transport surveys and methods has emerged, including new methods of electronic data collection and observation, e.g., via smartphone apps, and increased computing resources, whereby both issues go hand in hand. As a result, new market players are emerging (e.g., companies that provide apps for tracking). Other players use existing data from new sources (e.g., cell phones) to calculate and map traffic demand. This development results in uncertainties and a constant discussion of the advantages and disadvantages of emerging data sources and methods in terms of new insights and an approximation to the "ground truth" of actual transport situations and behavior. The challenge lies in evaluating these data sources in terms of their accuracy, representativeness, and usability for transport planning. Additionally, the integration of data from multiple sources raises methodological questions regarding harmonization and validation.

2. **Ensuring data quality and reliability:** New data collection techniques often introduce uncertainties related to sample bias, incomplete observation and item non-response, and varying levels of detail. Hence, are they leading to a new, better "Ground-Truth"? The key question is: Can new methods be assessed in terms of quality? Addressing data quality and reliability is crucial to ensure that empirical methods provide robust foundations for transport models and policy decisions. Standardized validation frameworks and best practices must be incorporated into the revised EVE.

3. **Balancing traditional and innovative approaches:** While new technologies offer innovative ways to collect travel data, traditional survey methods such as household travel surveys and manual traffic counts remain important. The challenge is to strike a balance between established methodologies and newer approaches while maintaining long-term comparability of transport data. A key issue is defining the appropriate stage at which experimental methods should be incorporated into the EVE.

4. **Data protection, open data, and ethical considerations:** With increasing use of digital tracking and passive data collection, privacy concerns and legal requirements (e.g., GDPR) must be carefully addressed. Furthermore, open-source data and data management have gained significance, which was not a major issue in 2012 but is now increasingly relevant and closely linked to technological development. The revised EVE needs to provide clear guidelines on ethical data collection, anonymization techniques, and compliance with legal frameworks. Additionally, administrative guidelines suggest that tax founded data collections should be made accessible, ensuring transparency and reproducibility, especially for engineering calculations and project assessments.

5. **Facilitating knowledge transfer and practical application:** New technologies require practitioners to have at least a basic understanding to enable informed decision-making, such as drafting tenders. The rapid evolution of empirical methods makes it challenging for practitioners to stay up to date. The revised EVE should not only document methodologies but also facilitate knowledge transfer through case studies, practical recommendations, and training materials for transport planners and policymakers. Additionally, it should help establish contacts with new market participants.

6. **Defining the scope and limits of data fusion approaches:** With the increasing relevance of data fusion techniques, it is crucial to establish clear boundaries for their inclusion in the revised EVE. A key question is where methods like digital twins should be considered and whether such advanced concepts should be part of a practitioner's knowledge base. Tracking methods also require classification within traditional survey types, hybrid approaches, and observation techniques.

7. **Longevity and future-proofing the guidelines:** Transport planning guidelines typically remain in use for a decade or longer. Given the fast-paced development of empirical methods, the revised EVE must be designed to accommodate future advancements. This includes providing adaptable frameworks and mechanisms for continuous updates without requiring a complete overhaul. A critical self-reflection on the limits and possibilities of survey approaches is essential, particularly in light of declining response rates. The revised guidelines must incorporate a balanced level of critique to ensure their relevance and practical applicability.

By addressing these key challenges, the revised EVE aims to serve as a comprehensive, reliable, and future-oriented guide for transport planning practitioners, balancing methodological rigor with practical applicability.

4. The international perspective on recommendations on empirical methods for transport planning practice and administration

In our view, the advancement of transfer path of empirical methods from academia to practitioners is a challenging issue, not only in Germany. It is likely that many researchers internationally are facing similar challenges. In our view, the ISCTSC conference is the ideal platform for exchanging ideas on this important topic at the international level.

In particular, internet research on this topic has shown that it is not possible to obtain international information on this topic without a platform like the ISCTSC. There are two reasons for this: firstly, these recommendations are available only in the local language, with no focus on translation into English. Secondly, the publishers and their publication policies are heterogeneous. In Germany, the EVE document cannot be viewed and downloaded on the internet without barriers due to the publication policy of the FGSV. These circumstances make international research considerably more difficult. Therefore, the ISCTSC conference is an ideal opportunity for us to discuss knowledge spill-offs from transport research into survey practice, to gather and discuss findings from different countries, and to learn from each other.

Central questions to discuss with the community are:

- How does a knowledge exchange on travel surveys between transport research and transport practice and administration generally take place in different countries?
- Are there written recommendations or guidelines for practice?
- Are there any other active transfer paths besides guidelines (e.g., seminars,…)?
- If there are any, how will these guidelines be created (who is involved, how often are they updated, etc.)?
- How are the challenges discussed in this paper dealt with when revising the guideline in the individual countries?

In addition, we would like to discuss whether an extended exchange between different countries, beyond the ISCTSC workshop, would be interesting or desirable in order to learn from each other, etc.

5. Conclusions and outlook

This paper has underscored the pivotal role of empirical data in transport planning and the necessity of evolving methodologies to keep pace with technological advancements. The existing EVE 2012 has provided a robust foundation for transport survey practices in Germany. However, the rapid emergence of new data collection techniques, such as smartphone applications and mobile phone data analytics, alongside increased computing capabilities, necessitates a comprehensive revision of these guidelines. The integration of innovative data sources introduces both opportunities and challenges. On one hand, these technologies offer enhanced data granularity and real-time insights, enabling more accurate modeling and forecasting of transport demand. On the other hand, they raise concerns regarding data accuracy, reliability, privacy, and ethical use. Balancing traditional survey methods with these new approaches is essential to maintain data comparability and continuity, ensuring that transport planning remains both robust and adaptable. Moreover, fostering effective knowledge transfer from academia to practitioners is crucial. Providing practitioners with the necessary understanding of emerging technologies will empower them to leverage these tools effectively, facilitating informed decision-making and innovative solutions in transport planning.

Looking ahead, the revised EVE aims to create a future-proof framework that accommodates ongoing technological advancements while preserving the integrity and reliability of empirical data. Additionally, promoting open data and robust data management practices will ensure transparency and reproducibility, fostering public trust and accountability. In conclusion, the updated EVE will serve as a comprehensive, adaptable, and reliable guideline for transport planning practitioners. By embracing innovation and maintaining methodological rigor, the revised guidelines will support effective transport infrastructure development, service provision, and policy formulation, ultimately contributing to the creation of sustainable and efficient transportation systems.

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