

## GHG BALANCING OF RAILWAY INFRASTRUCTURE: DATA AVAILABILITY FOR EVALUATING GREENHOUSE GAS EMISSIONS OF RAILWAY CONSTRUCTION PROJECTS

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**Summary:** The carbon footprint of railway infrastructure projects is becoming an increasing focal point for politicians and the general public. Its consideration is becoming a legally binding part of the planning approval process in many countries. Although railway transport is operationally recognized for its positive environmental impact, its infrastructure lifecycle shows a less favourable carbon footprint. Addressing this imbalance, it is necessary to subject the infrastructure to a detailed analysis and assessment with regard to the overall balance of railway transport projects. This applies in particular to new construction and expansion projects, where the availability and quality of data is a key challenge of comprehensive greenhouse gas (GHG) accounting. While standardized components of railway systems exist and are used in current lifecycle assessments, a range of project-specific variations must be considered. In order to establish a foundation for the comparison of different planning options, it is necessary that GHG balancing methods for projects are applicable as early as the pre-planning phase. At this stage of the project lifecycle, not only data availability is limited, but assumptions have to be made about future infrastructure operation, forecasted traffic effects and end of life, so that many statements relate to the future. This paper focuses on identifying and addressing data challenges for GHG accounting of railway infrastructure projects in early planning phases. It provides a systematic analysis of the data sources required to assess emissions of railway infrastructure. The focus is on data for a lifecycle analysis of the specific railway infrastructure project, covering its construction, operation, maintenance and disposal or recycling at the end of life, as well as for an orientating classification of the project in the overall transport balance. By analysing existing methodological approaches and examining the availability of data in the pre-planning phase through a case study, discrepancies between available and required data are identified. The research proposes the extent to which generalisations are permissible and necessary, and aims to develop practical methods for GHG accounting that can be integrated with available data into the early planning process. By addressing the critical issue of data availability, this research bridges the gap between theoretical GHG accounting models and practical implementation in railway project planning. The developed methods enable planners to incorporate GHG accounting early in the project lifecycle, thereby supporting sustainable decision-making and fostering greater uniformity in railway infrastructure planning. In doing so, they are strengthening the role of the railway sector in achieving climate goals and closing the sustainability gap between operations and infrastructure.