

# Methodology to Assess Sustainable Mobility in LATAM Cities

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## Abstract

As the first step toward implementing strategies to improve mobility in urban centers, governmental authorities must assess their present situation in order to identify the most effective actions that should be included in their short and long-term plans. However, there is not a well-established methodology to carry out such an assessment. The already existing ones are subjective, incomplete, costly, and hard to implement, especially for the case of Latin American countries. This paper proposes a comprehensive methodology to carry out this assessment. It uses recent advances in information technologies and includes the use of web map services, telematics data, and low-cost vehicle emission tests. The main purpose of the proposed methodology is to facilitate the identification of adequate strategies to improve sustainable urban mobility in a city of interest. This methodology is based on Fraunhofer-Morgenstadt City Lab methodology and results on urban mobility obtained by the City Lab team composed by the University of Stuttgart IAT, Fraunhofer Institute for Industrial Engineering IAO, Tecnológico de Monterrey, and the Municipal Planning Institute IMPLAN Saltillo in the city of Saltillo, Mexico. The methodology was designed to allow the participation of third parties that could not be well informed on the local particularities of the city. Therefore, this methodology includes the documentation of the current situation of the city on the many aspects connected to the mobility of the city. Thus, the proposed methodology is divided into three phases: i) Describing the region of study, ii) obtaining local data to evaluate a proposed set of Key Performance Indicators (KPIs), and iii) performing a mobility assessment based on a benchmarking evaluation of the KPIs with comparable and/or reference cities. As an example of application, a mobility assessment was carried out for Saltillo, a medium-sized city in northeastern Mexico, which is considered a typical city in Latin American countries. Results indicate that this methodology can be replicated at a low incremental cost and that it leads towards the identification of the most sustainable (economic, environmental, and social) actions that should be implemented in these cities considering their local circumstances.

## Keywords

Smart Mobility, Smart Cities, Sustainable Transport, Telematics, Information technology.

## Biographies

**José Ignacio Huertas** is a full-time professor of the Mechanical Engineering Department at Tecnológico de Monterrey. Researcher of the Energy and Climate Change Research Group. He belongs to the Mexican System of researchers (SNI) level 2, and to the Mexican Academy of Science. He has published 3 books, more than 50 indexed papers, has 2 patents conferred, has graduated 8 PhD and 89 MSc students, and has completed more than 90 research projects financed by private companies and governmental institutions in Colombia, Mexico, Spain, France, and USA. Areas of interest: Energy, Combustion, Vehicular emissions, Air pollution and Smart mobility

**Sonja Stöffler** is a researcher and project manager in the research unit "Mobility and Innovation Systems" at the IAT University of Stuttgart. Focused on innovative mobility solutions and future mobility ecosystems, evaluating the right measures and suitable cooperation formats for a sustainable transformation. Deputy head of the replication work package in the EU-SSCI project TRIANGULUM, developing a concept and framework of a replication process that relies on workshops, city assessments, on-site visits and other tools, providing the chance for cities to embark on the smart city world.

**Trinidad Fernández** is a Project manager and researcher in the research unit "Urban Economy Innovation", part of the Competence Center for Urban Systems Engineering at the Fraunhofer Institute for Industrial Engineering (IAO). Research projects in the fields of sustainable urban development and climate change mitigation through the integration of smart city concepts and solutions. Coordinated the first implementation research action from the European Commission for smart cities and communities called Triangulum, multidisciplinary smart city project focuses on the implementation of smart city solutions in Manchester (UK), Stavanger (Norway) and Eindhoven (Netherlands) in the mobility, energy and ICT sectors to be replicated in Sabadell (Spain), Prague (Czech Republic) and Leipzig (Germany) in a strategic way. Involved in the last years in the development of the "Morgenstadt City Index" indicators within the framework of the Morgenstadt Innovation Network and took an active role within the implementation of digitalisation strategies for the Baden Wuerttemberg region (Germany)

**Roberto Castañeda** is an architect with a master's degree in urban planning from the Universidad Autonoma de Coahuila. Currently in charge of the urban planning department at Instituto Municipal de Planeación de Saltillo (IMPLAN), Coahuila. Interest in urban development, sustainable mobility and public space. Contribution and improvement of social cohesion, road safety, urban resilience, green infrastructure and universal accessibility. Focused on mitigation and adaptation to climate change in cities. Volunteer promoter of the use of the bicycle as a safe means of transport and the promotion of cultural activities and the design of urban regeneration projects in marginalized areas.

**Xanin García** is a PhD in Economic Sciences (Autonomous University of Baja California). Master in Regional Economics (Socioeconomic Research Center of the Autonomous University of Coahuila). Bachelor of Economics (Faculty of Economics Saltillo Unit of the Autonomous University of Coahuila). Professor at academic institutions such as the Autonomous University of the Northeast, Autonomous University of Coahuila and the Technological Institute of Saltillo. Certifications by INAFED, UNAM, SHCP, UN Women and Economic Commission for Latin America and the Caribbean (ECLAC) on development issues local, gender, public policies, project formulation and strategic planning.

**Oscar S. Serrano** is a PhD candidate and Engineering Science's Master from Tecnológico de Monterrey, Automotive Engineer from Universidad del Azuay, focused on energy efficiency in transport. Academically always involved in projects related to sustainable mobility, energy efficiency and environment, research line focused on real fuel

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**Antonio E. Mogro** is an automotive engineer graduated with distinction from the University of the Armed Forces ESPE, in Ecuador. He has a master's degree graduated as an honor student in automotive engineering from the Tecnológico de Monterrey. Currently, he is a PhD candidate from the Tecnológico de Monterrey where he works as an academic researcher focusing on real world vehicle emissions. He has 6+ years of experience in research centers, 12+ years in academia, 10+ research projects and 9+ working/published articles.

**Duvan Alvarado** is an engineer graduated from the Environmental Engineering degree from the University of Santo Tomás in Bogotá, Colombia. He carried out a research stay in the Energy and Climate Change Research Group of the Tecnológico de Monterrey. Involved in sustainable mobility projects, pollutant dispersion and characterization through geographic information software (GIS).