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Quantifying the impacts of sustainable city logistics measures in the Mexico City Metropolitan Area

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Abstract

This paper discusses the assessment of the potential impacts of a number of city logistics measures proposed for the Metropolitan Area of the Mexico City Valley: off-hour delivery programs; policies and agreements to increase cargo consolidation and decrease empty trips; and the implementation of preferential truck routes. The analyses consider the impacts on travel distances, travel times, accidents, emissions and health impacts. In doing so, the authors discuss the proposed measures, the assumptions used to estimate the impacts, and the information required. Different scenarios are evaluated for the various measures.

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Keywords: empty trips; off-hour deliveries; preferential truck routes; emissions; congestions; health impacts

1. Introduction

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The Mexican urban areas, especially the metropolis and megalopolis, are experiencing major mobility challenges because of the high motorization rates, increased levels of personal auto use, urban sprawl, and deficient transport services, among others. These factors are producing enormous pressure on the passenger and freight transport systems and the built infrastructure. It is of great importance to recognize that although bringing the much needed flows required for the consumption and manufacturing sectors that are vital for these urban economies, the freight transport system is also responsible for the generation of negative externalities. These include increased fuel consumption, congestion levels, emissions, and pollutants that impact health, thus reducing the economic welfare of the region by directly impacting the productivity and competitiveness of the private sector, and producing detriments to the quality of life. If unattended, the conditions are expected to deteriorate resulting from the continuous growth in demand experienced in these cities.

During the last 20 years, the CO₂ emissions produced by the transport sector have increased by 87% (INECC, 2011). Additionally, the sector is one of the main generators of black carbon particulate pollutants and the precursors of the tropospheric ozone, which are part of the short lived climate pollutants (SLCPs) largely impacting air quality and climate change. It is estimated that in 2010, the health impacts due to air pollution represented a cost to the country equal to 4% of its gross domestic product (GDP), and about 57% of all environmental costs (INEGI, 2011; World Health Organization, 2011). In the case of the freight transport, the large freight vehicles operating in Mexico City, representing only 1% of the fleet, were responsible for almost 40% and 45% of the emissions of PM₁₀ and PM_{2.5}, respectively. Medium freight vehicles, representing 3% of the fleet, generated 20% of the particulate matter (SMA-DF, 2010). To remediate the issue, the Mexican Natural Resources and Environmental Office (Secretaría de Medio Ambiente y Recursos Naturales - SEMARNAT), and the Transport and Communications Office (Secretaría de Comunicaciones y Transporte – SCT) under the United Nations Framework Convention on Climate Change (UNFCCC) are interested in developing a National Appropriate Mitigation Actions (NAMA) program for the urban freight sector in the country. The NAMAs are a new concept that considers financing opportunities under the UNFCCC to help developing countries mitigate climate change (UNFCCC, 2011). Although there are no specified guidelines to develop the NAMAs, many countries and organizations are investing efforts and resources on their development at the local level.

The main objective of this paper is to discuss the results of a project to develop a NAMA program for the urban freight system in the Metropolitan Area of the Mexico City Valley. Specifically the paper describes the different city logistics measures analyzed to be implemented in order to reduce the environmental impacts of the freight system, as well as other externalities (Clean Air Institute, 2012). Although a set of 12 groups of measures were initially proposed, the final assessment of impacts only considered three: voluntary off-hour freight operations; updated policies/ cooperation agreements to increase cargo utilization to reduce empty trips; and improved conditions to foster the use of ring roads/subutilized infrastructure and develop preferential routes. The potential impacts from these measures were analyzed in terms of congestion, emissions, safety and health impacts. The analyses are based on performance scenarios with different levels of impacts in terms of shifts and reductions of vehicle trips (in different time segments and pieces of infrastructure), variable travel speeds, increased number of stops per tour, reductions in empty trips, and reductions in travel distances. In total 19 scenarios were designed considering international experiences and assessments of the Mexican conditions. It is important to mention that publicly available data were used to conduct the analyses, thus the results are expected to only provide an indication of the potential impacts. Moreover, data limitations only allowed estimating the impacts on the freight system and not on the urban transportation system as a whole.

2. City logistics measures

The authors conducted a comprehensive review of international city logistics measures from the perspective of their applicability to the Mexican context. The reader is referred to the Clean Air Institute (2012) for more information. After a preliminary assessment that included twelve categories, six measures were selected for further review: 1) Reduced tolls to the freight transport agents that participate in the Clean Transport Program (Programa de Transporte Limpio) established by the SEMARNAT. A program based on the SmartWay Program (U.S. Environmental Protection Agency, 2013); 2) Time restrictions for the freight traffic flows in the area; 3) Integral policy to foster intermodal centers and urban consolidation centers; 4) Updated policies/ cooperation agreements to increase cargo utilization to

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