16th Conference on Reliability and Statistics in Transportation and Communication, RelStat’2016, 19-22 October, 2016, Riga, Latvia

Methodology to Assess the Effects of ICT-measures on Emissions. The Case Study of Madrid

Andrés Monzon\textsuperscript{a*}, Álvaro García-Castro\textsuperscript{b}, Cristina Valdes\textsuperscript{c}

\textsuperscript{a}Department of Civil Engineering: Transport and Territory, Universidad Politécnica de Madrid, Madrid, Spain
\textsuperscript{b}Transport Research Centre, Universidad Politécnica de Madrid, Madrid, Spain
\textsuperscript{c}Empresa Municipal de Transporte, Madrid, Spain

Abstract

The road transportation sector is one of the largest emitters of Greenhouse Gases, which triggered the climate change. Much effort is dedicated to reduce the emissions, highlighting the use of Information and Communication Technologies. In this framework, the ICT-Emissions project has developed the methodology necessary to estimate the effects of ICT-measures on emissions. Based on this methodology, this paper presents the results of the measures tested in the case study of Madrid: Section Speed Control, Variable Speed Limits, Cruise Control, Eco-Driving and Green Navigation. Some of the measures have been analysed with real Floating Car Data, comparing the fuel consumption before and after implementing the ICT-measures. On the other hand, Green Navigation results are based only in simulation. Although the level of analysis is different for each of the tested measures, the results show positive values in terms of CO\textsubscript{2} emission reductions and prove the applicability of the ICT-Emissions methodology.

© 2017 The Authors. Published by Elsevier Ltd.

Peer-review under responsibility of the scientific committee of the International Conference on Reliability and Statistics in Transportation and Communication.

Keywords: GHG emissions, ICT-measures, Floating Car Data, traffic simulation, emission simulation

* Corresponding author.

\textit{E-mail address:} andres.monzon@upm.es
1. Introduction

Greenhouse gases (GHG) emissions and overconsumption of energy resources represent a global problem, which concerns both their causes and consequences (Ramanathan and Feng, 2009). Changes in the atmospheric presence of greenhouse gases and aerosols alter the energy balance of the climate system. “Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level” (IPCC, 2007).

The transportation sector is one of the largest emitters despite the advances in the field of engine technology. According to statistics provided by the European Environment Agency (2013), GHG emissions from the road transportation sector have started to decline, but still account for about 93% of the emissions attributable to the transportation sector, and approximately 20.4% of total emissions. The transport sector accounted for 26% of global energy consumption in 2010, and transportation energy use is expected to increase by 1.1% every year from 2010 to 2040 according to the International Energy Outlook 2013 Reference case (Energy Info Administration, 2013).

In this context, much of the effort dedicated to reducing energy consumption and emissions has focused on the road transportation sector. The European Commission (2009) proposes an integrated policy to tackle the problem from different approaches; these include particularly demand management, a shift to cleaner modes, improving vehicle technologies, traffic management, and the use of information and communication technologies (ICT). ICT applied to transportation (Intelligent Transportation Systems, or ITS) is a broad field that has the potential for producing positive effects on efficiency, safety, comfort and the environment (European Commission, 2008).

2. The ICT-Emissions project methodology

The aim of the ICT-Emissions project (European 7th R&D Framework Programme) is to find a methodology to simulate in detail the effects on CO2 emissions of a number of ICT measures applied to transportation, commonly known as Intelligent Transportation Systems (ITS). Each of the considered ICT measures affects CO2 emissions differently. From a macroscopic point of view it can be considered that demand, fleet composition and average speed determine the level of emissions (Ntziachrístos and Samaras, 2000). However, taking a detailed look at each vehicle, the processes of acceleration and deceleration and the engine performance are also proved to be critical. Moreover, the areas of application are highly variable and the effects in certain environments may produce undesirable results, causing the need of using models to simulate these effects before investing the large amounts of capitals that in some cases require these measures. Fig. 1 shows the structure of the ICT-Emissions methodology.
دریافت فوری

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات