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Understanding carbon: Making emissions information relevant

William Brazil [a], Brian Caulfield [a,*], Nadine Rieser-Schüssler [b]

[a] Department of Civil, Structural and Environmental Engineering, Trinity College Dublin, Dublin 2, Ireland
[b] Institute for Transport Planning and Systems, ETH Zurich, Zurich, Switzerland

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ABSTRACT

This paper examines methods of communicating and presenting information to individuals about transport and travel related carbon emissions for use in online journey planning and smartphone applications. It examines four methods of framing transport related emissions and the effect of these on ease of understanding and the potential to alter respondents' mode of transport. On-line carbon calculators provide users with information about the carbon emissions that result from the selection of one mode of transport over another. Each reflects an approach currently used by on-line carbon calculators. Results indicate that there is a strong correlation between understanding of methods and likelihood of altering mode choice.

1. Introduction

Carbon dioxide (CO_2) emissions arising from human activities are now widely accepted to be a cause of accelerated global climate change. Personal transport and travel is an area where individuals can make conscious choices that have a direct impact on their personal carbon footprint by changing their transport mode. Often more immediate concerns such as personal travel time and cost can take precedent over concerns about the environment.

Many individuals are also "locked" into certain habits that take precedence over environmental concerns when considering mode choice. The result of which is that while individuals may have an intention to modify their travel behaviour and may also have access to feasible low carbon alternative modes, they do not consider these alternatives when undertaking a trip, rather they operate on "autopilot" (Gardner, 2009). One solution to this problem has been identified as the provision of accurate, personalised carbon emission information in a format that is easily understood and relevant to the individual (Anable et al., 2006).

Previous studies have looked at emotive carbon equivalents such as offsetting by planting trees and "earth equivalents" (Waygood and Avineri, 2011), whereas here we examine techniques commonly used by online carbon footprint calculators and journey planners with specific reference to their potential application for smartphone applications and journey planners. The ease with which users can understand information regarding carbon emissions, and how the format of this information influences the likelihood of behaviour change is examined through the comparison of four methods of emissions information framing.

2. Method

A survey was undertaken in the greater Dublin Area to assess user requirements for a persuasive travel advisor with the aiming of reducing travel related CO_2 emissions. It took the form of an on-line questionnaire distributed via a number of

* Corresponding author. Tel.: +353 1 8962534.
E-mail address: brian.caulfield@tcd.ie (B. Caulfield).

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sources including the electronic notice boards of semi-state organizations. Four hundred and fifty seven responses were received; a completion rate of 77.6%.

Due to way the survey was distributed, the sample cannot claim to be representative of the Irish population as a whole. The sample has more respondents in the higher brackets for education and employment type than would be expected from Irish census data for 2011 (Central Statistical Office, 2012), and more female respondents (54.4%). It is likely that the electronic questionnaire format would have been more accessible to those individuals engaged in office based employment with consistent access to information systems than those engaged in manual labour. While there are a number of issues surrounding the use of online surveys, in particular with regard to sampling biases, we assume that is somewhat mitigated by the nature of the study area. Smartphone applications of this nature are more likely to be accessed by individuals who already possess an interest or concern about the impact of their transport behaviour on the environment. These individuals may not constitute the whole population. When the survey was distributed, it was clearly communicated that the survey dealt with these issues, and, therefore, we assume that individuals completing the survey share some of the same characteristics as the sub population we are hoping to capture.

Survey respondents were presented with four methods of understanding carbon emission arising from their trips (see Fig. 1). Each presented respondents with information on the attributes of bus, driving and heavy rail. As our purpose was to examine how carbon emissions information could be integrated into a smartphone application interface, information on travel times and trip costs associated with each mode were also presented as these attributes are likely to be included in any transport related application. The approach was based upon methods already being employed by journey planning applications and carbon calculators. To ensure that respondents were aware that they were being asked to assess the method of presenting emissions, rather than choose the mode they would take, the attribute levels for each mode (time, cost and emissions) were kept constant for each method.

- **Method 1**, the "Basic Numerical Method", presented respondents with simple numerical information regarding the emissions that would be produced by each mode. Emissions information was presented in terms of mass in kilograms of CO_2 produced by each mode with no additional information available to the user. This format be similar to the approach taken by many carbon calculators and is comparable to methods of communicating other intangible units such as calorie information on the packaging of food products.

Fig. 1. Methods used to display emissions.