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Indirect tourism transport:
A proposed carbon footprint assessment

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A Proposed Carbon Footprint Assessment

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Abstract

As the tourism industry's greenhouse gas emission impacts on the global environment is increasing, carbon accounting is fast becoming a vital tool for establishing the magnitude of impacts and identifying the players responsible. The unique trip characteristics of private and commercial vehicles in tourist destinations makes it difficult to assess real impact levels.

This paper proposes a methodology for assessing the carbon footprint of Indirect Tourism Transport (i.e. delivery and service vehicle operations), serving the tourism industry. It described a unique data collection approach from tourism businesses and transport operators, and how this information is processed and used to assess the tourism industry's supply chain carbon footprint. Distance and weight of load delivered to the customer are considered the variables that determine carbon footprint in this methodology.

The methodology could be used to account for tourism industry's share of total carbon footprint of commercial vehicle operations, on the basis of regional, national or international tourist destinations in order to establish the sustainability of the industry's indirect transport. It could also act as a first generation forecasting model for assessing

future carbon footprint projections, to be associated with tourism transport for tourist destination planning purposes.

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1. Introduction

World tourism has continued to grow in the last few years in spite of uncertainties posed by the global economy (e.g. rising oil prices) (WTO, 2008). Concerns are therefore beginning to be raised about the high carbon intensity associated with tourism transport, particularly with international air transport (Gössling et al., 2002), and other forms of direct and indirect domestic transport forms used in providing for the needs of tourists at tourist destinations.

The challenge to tourism industry stake holders, is finding ways of reducing these environmental impacts as much as possible (Gössling et al., 2005). Preserving the sustainability image of New Zealand's tourism brand is critical, particularly considering the rising expectations of overseas consumers (Clark & Unterberger, 2007; Fraser, 2008),. Addressing issues of responsibility for environmental impacts, within the supply chain of the tourism industry, is one way of equitably dealing with the problem. In this paper, we identify the main Indirect Tourism Transport (ITT) types, and propose a methodology for accounting for the Carbon Footprints (CF) resulting from the activity of these ITT forms.

2. Literature Review

Transport has emerged as a source of concern for sustainability in recent years. It highlights the vulnerability of the environment, to human impacts from tourism and the need to consider its preservation (Page, 1999). The environmental impacts of all aspects of the travel industry are increasingly being questioned, due to pressure from environmental groups such as Sustainable Travel International, who demand more sustainable forms of travel, termed *'ethical tourism'* (Clark & Unterberger, 2007). This is coupled with the ever increasing sophistication of tourist demands and choice of destinations (Koumelis, 2007). Clark & Unterberger (2007), based on these emerging trends, concluded that a more comprehensive environmental impact analysis should

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include less obvious emission sources such as the transportation of goods we consume, like tourism supply logistics.

Black (2004), reports that if transport systems are not sustainable then one could argue that the tourism that depends upon them is also non-sustainable. Whilst the sustainability of tourism activity is a widely discussed and contested concept, most of the literature on tourism impact on the environment rarely addresses the externalities and inequalities arising from transport (Hall, 2004), such as hospitality industry supply delivery, waste collection, service calls, and tourism employee commuting (Kelly & Williams, 2007). Several studies have looked at the sustainability of tourism transport (Becken, 2005; Hall, 1999; Kelly & Williams, 2007; Lumsdon & Page, 2004), yet the relationship between tourism and transport has rarely been discussed within the context of tourism supply chain.

Tourism businesses are embracing the idea of sustainable operation, and subscribing to different environmental accreditation and verification schemes such as Green Globe, Qualmark, CarboNZero (Fraser, 2008; Greene Globe, 2008; Qualmark, 2008). This has created the need for credible and consistent methodologies for sustainability accounting. The carbon footprint approach, which measures an individual or business entity's contribution to global warming in terms of the amount of greenhouse gases they produce, either directly or indirectly, usually measured in units of carbon dioxide equivalent (Lynas, 2007). Wiedmann & Lenzen (2007), identify the CF methodology as a unique way of unraveling supply chain boundary definition complexities.

3. Proposed Methodology

Transport forms classified as ITT include transport for delivering supplies to tourism businesses, collecting waste from tourism facilities, providing services on site of tourism businesses, and employee commuting. However, the methodology proposed in this paper will be limited to commercial vehicle operations (i.e. principal commodity suppliers

or freight companies, waste collectors, service providers), servicing accommodation, food & beverage establishments.

Modelling the CF associated with ITT involves the following activities:

- Collating and aggregating travel activity data for all delivery and service tours obtained from tourism businesses and freight companies.
- Identifying the frequency of deliveries or service calls, taking into consideration peak and off-peak tourism season fluctuations.
- Identifying vehicle categories involved.
- Obtaining fuel type and consumption rate of the respective vehicles.
- Obtaining the emission factors of the respective fuels used.

3.1. Data

A sample frame of tourism establishments is first compiled from tourism trade manuals, yellow pages, and tourism website directories. Questionnaires are designed and mailed to tourism businesses identified. Supplier and commodity data are collected from tourism businesses in a mail back survey. Other survey methods could be used to supplement the mail back survey (e.g. interviews), in case the response rate is low (Altinay & Paraskevas, 2008). The survey will provide information on:

1. Type, size, and location of tourism establishment
2. Names and locations of suppliers or service provider's, commodities delivered or services provided, and usual time or frequency of delivery and/ or service calls to tourism establishments.

From this database, the main suppliers, service providers, or freight companies are identified and this forms the sample frame for the second survey (transport activity levels). Main suppliers, freight companies, service providers are contacted to arrange

for conducting Global Positioning System (GPS) surveys with their delivery and/or service call vehicles.

3.2. GPS Survey

Stopher & Jones (2003) observe that GPS survey methods provide very precise information about locations to and from where vehicles travel, time of travel, and routes. Consequently, the next survey stage we propose involves collecting travel and trip characteristics data from commodity suppliers or freight companies who deliver to the tourism businesses. Travel diaries are a popular data collection instrument for freight transport surveys (Cambridge Systematics, 2007). However, freight companies/ suppliers are usually reluctant to volunteer trip activity information of their fleet, as they consider this commercially sensitive.

To overcome this difficulty, we propose adopting GPS survey strategies, where location and time specific trip data is obtained from real delivery trips of selected freight companies accompanied by the researcher. Unlike traditional travel diaries, Wermuth et al., (2003) identified this strategy as useful in overcoming the unwillingness and inability of subjects to respond. To correctly capture the information required, GPS based observation methods are proposed. Wolf (2000) as cited in (Wolf et al., 2003) examined the use of GPS loggers and concluded they were a good replacement for traditional travel diaries as they are able to capture travel and trip characteristic such as locating delivery addresses, routes used, trip lengths, and stop time, in more detail.

4. Trip Chain Analysis

Holguin-Veras & Patil (2005) in their analysis of trip patterns of commercial vehicles, illustrate the trip chain behaviour usually demonstrated by commercial vehicles. We propose a methodology for estimating the CF (i.e. CO_2 emissions) of these trip chains,

and subsequently sharing this CF to the customers served. From this methodology, tourism's CF can be estimated.

In estimating the CF of a single trip, we need to establish the variables that determine this footprint. Ortuzar et al.,(1994) and Rodrigue et al., (2006) identify travel time and distance as the principal variables for determining travel cost, aside truck payload weight, topography of routes, etc. We use distance and weights of commodities delivered as the variables for estimating the CF, and assume that:

- Trips start and end at the base station O, as in figure 1 below (supplier/ service provider's location)
- Delivery or service vehicles use the most optimum routes to serve customers
- Carbon footprint of the return trip (i.e. from last customer back to base station O) is shared equally among customers

Figure 1
Trip Chain Pattern
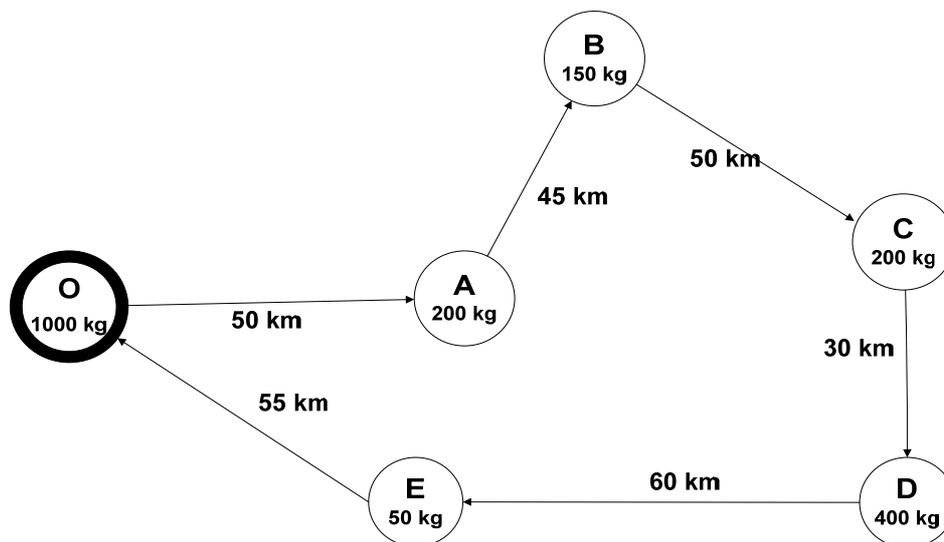
The model for apportioning CF for the respective customers in the trip is being developed and when completed will show each customers CF in the trip tour. This will further be aggregated to show CF the tourism industry is responsible for.

5. Conclusion

In short, this paper has outlined a proposed methodology for measuring CF of ITT. The paper has described the data collection approach required for information from tourism businesses and how this data is used to assess tourism industry's supply chain CF. Understanding the indirect transport component of tourism will become increasingly important, as the industry faces a sustainability image crisis and has to meet the demands of the increasing environmentally conscious consumer. By establishing the magnitude of environmental impacts and clearly identifying the parties responsible, strategies for addressing such impacts can then be developed to mitigate such impacts.

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