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## Regional freight demand estimation using Korean commodity flow survey data

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### Abstract

A commodity flow survey (CFS) is conducted to analyse commodity flow characteristics and to compile statistics for goods movement in several countries. In Korea, the CFS has been conducted every five years since 1998. Freight travel information collected through this survey is mainly used to estimate freight demand as well as freight statistics. This paper provides details of the Korean CFS and introduces a procedure for regional freight demand estimation. Though freight demand focuses on commodity flow, the conversion of commodity flow into the equivalent number of trucks and traffic assignment for truck trips is also presented.

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*Keywords:* Korean commodity flow survey; freight demand estimation; freight O-D

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### 1. Introduction

Several countries conduct a CFS periodically, and they estimate freight demand using the survey results. The CFS in the US is conducted every five years as a part of the Economic Census, and recently its fifth CFS was conducted in 2012 (RITA, 2014). A freight origin-destination (O-D) matrix is developed by the Freight Analysis Framework (FAF) modelling. In the FAF modelling, several data sources are used, but the most important is the US CFS (FHWA, 2011). In New Zealand, the primary data source for freight demand estimation is also a market survey for freight consignors and carriers. In addition, supplementary data sources, such as production data, export data and

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industry data, are used (Bolland et al., 2005). Statistics Norway (SSB) also conducted a CFS of Norwegian industry and wholesalers (Hovi and Johansen, 2008). In most countries that conduct the CFS, a freight flow matrix is estimated using the survey data.

The most recent CFS in Korea was conducted in 2011. The survey mainly consists of a shipper survey and a truck diary survey. The shipper survey is the main survey, which is used to estimate nationwide freight travel demand; it also collects shipment information such as quantity of goods, shipment destinations, transportation modes, and shipment frequency by commodity type. The sample of the shipper survey is designed by considering geographical location, number of employees, and industry type of an enterprise. Korea is administratively classified into 16 provinces and 251 counties. Enterprise size is classified into seven categories based on the number of employees, and industry type is sorted into manufacturing, wholesale, and primary industries, consisting of agriculture, forestry, fisheries, and livestock. There are about 20,000 valid samples in the shipper survey, and they are used to estimate commodity-based freight demand. A truck diary survey collects shipment information for a day, including the origin and destination, the quantity of cargo loaded and unloaded, the location of stops, and records of empty travelling. The sample for the survey is designed by considering shipment area, truck size, and truck business type (private or for-hire). Truck size is divided into three categories according to the loading weight. There are about 40,000 valid samples in the survey, and they can be used to estimate truck travel demand as well as analyse trucking characteristics.

In Korea, the national freight travel demand is estimated by using a four-step travel demand estimation method as one of the aggregate ways that is conventionally used in most countries (Beagan et al., 2007; Cantillo et al., 2012; Chow et al., 2010; FHWA, 2011). In commodity flow estimation, the origin of goods is defined as the production place of the goods, such as manufacturing factory and primary industrial area, but intermediate stops are not considered in the estimation. Goods are divided into 30 commodity types according to the Korean standard industrial classification.

This paper is divided into two parts: the CFS, and freight demand estimation in Korea. In the first part, survey details of the CFS are explained, focusing on a shipper survey and a truck diary survey used to estimate freight O-D matrices. In the second part, a commodity-based model using a four-step travel demand estimation method is presented. The procedure of freight demand estimation, from freight generation to the conversion of commodity flow into the equivalent number of trucks using survey data and truck assignment, is shown.

## 2. Commodity flow survey in Korea

The Korean CFS is conducted every five years as a national transportation survey. It is used to estimate regional freight flow, analyse commodity movement by commodity type, understand logistics status by region, and collect basic data for transportation policies. The CFS includes various sub-surveys, such as a shipper survey (mining, manufacturing, wholesale), a truck diary survey, in and out traffic counting at logistics hubs, an truck O-D survey at toll gates, a warehouse survey, and a hazardous material survey, as shown in Figure 1.

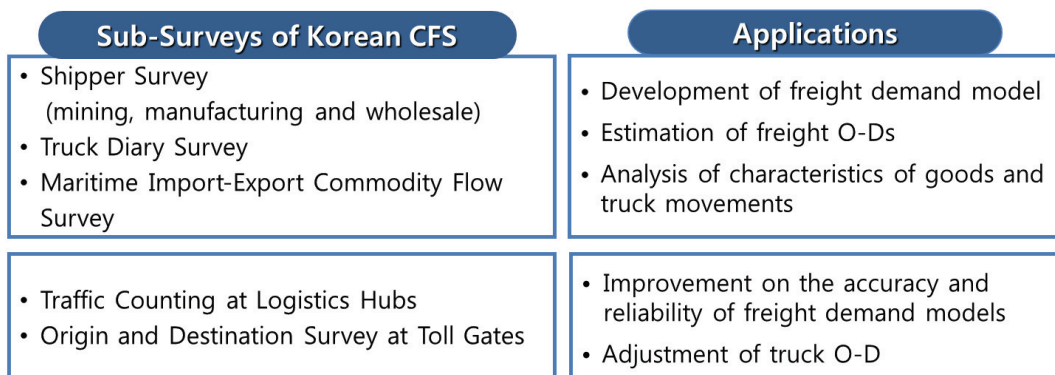


Figure 1. Sub-surveys of the Korean CFS for freight O-D estimation.

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