Estimation of Freight Trip Generation Rates for Korea Industrial Parks

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CONTETS

Chapter 1 Introduction

Introduction

Importance of trip generation data

- Application at the first step of 4-step travel demand forecasting process
- Elementary data in the valuation of transportation projects

- Effects on feasibility of projects

- So, the implementation of projects depends on trip generation

Use of freight trip generation data

- Input data in logistics as well as transportation projects

- Freight facilities planning

- Estimation of future commodity and truck volume

Objective

- To estimate a reasonable freight trip generation rate by industrial park in Korea

  Through a nationwide survey in Korea

Introduction

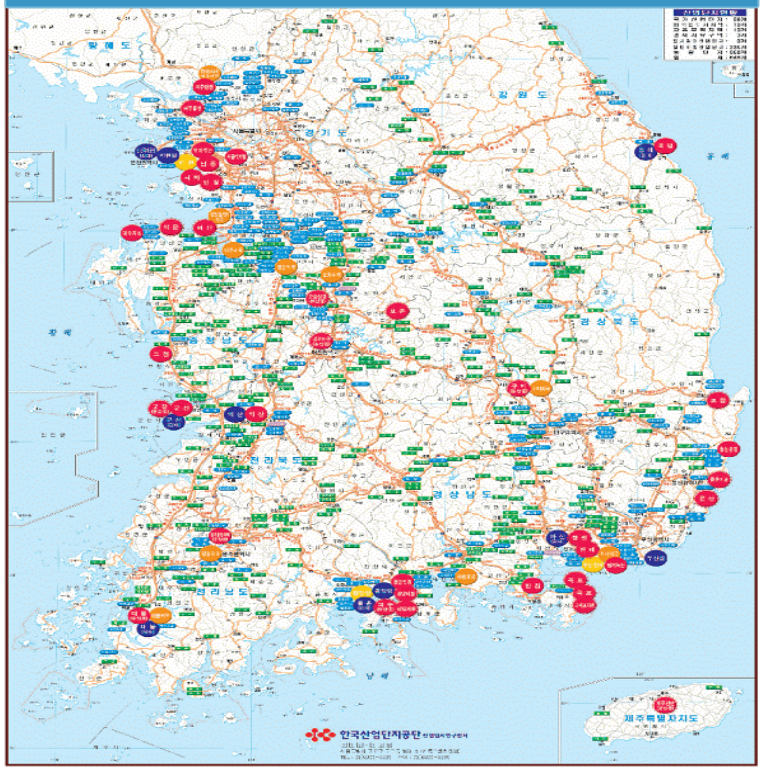
Industrial parks in Korea

- 3 types of Industrial park by management authority
  - National industrial park managed by a central government
  - Local and agro industrial park managed by a local government
- A lot of manufacturing companies are located in industrial parks

Current Industrial Parks

Type of industrial park	No. industrial parks
National	39
Local	277
Agro	372
Total	688

Industrial parks in Korea



Introduction

Why do we focus on industrial parks ?

- Result in the change of land use pattern and effect on future trip demands
- Production of a significant amount of manufactured commodity flow
- Generation of freight trip production and attraction
- Inclusion of access roads and railroads in the planning
- Significant effects on the feasibility of transportation projects

- Application of freight trip generation rate for industrial parks to allocate national investment budget to various projects

Current estimation method of the generation rates in Korea

- Using traffic volume data obtained from a commodity flow survey as part of national transport database project
- Using traffic volumes counted at facilities in industrial parks
- Using commodity production of industrial parks which are provided by Korea Industrial Complex Corporation

Introduction

Referable materials in U.S.

- Truck Trip Generation Data, NCHRP Synthesis 298 (2003)
  - Method of estimation of truck trip generation
  - Collection of truck trip generation from various states
- Trip Generation Handbook, ITE (2003)
  - Most widely used in U.S.
- Quick Response Freight Manual I, II (2003)
  - Research for freight demand analysis
- Others

Freight trip generation rate in U.S.

- No standardized freight trip generation rates in U.S.
  - Estimation of the rates by state, not a federal government
- No consistency of freight trip generation rates in U.S.
  - Different classification of the industry by state

Chapter 2 Issues

Issues

Limitations of current freight trip generation rates

- Transferability of freight trip generation rates
- A standard methodology for estimating freight trip generation rates
- A proper sample size for collecting data
- Freight trip generation rates which can reflect the characteristics of industrial parks

Example of truck trip generation rates used in Korea

- Use of different truck generation rates by a project

Project		Inbound Trip Generation Rates (trips/1,000m^2)			Outbound Trip Generatoin Rates (trips/1,000m^2)		
		Small truck	Medium truck	Large truck	Small truck	Medium truck	Large truck
Project A	National	0.6728	0.0613	0.0490	0.7351	0.0670	0.0536
	Other	0.4477	0.0791	0.1271	0.4805	0.0849	0.1364
Project B	National	0.6732	0.1374	0.0541	0.6091	0.1243	0.0489
	Other	0.6907	0.4536	0.2745	0.5958	0.3389	0.2207

Issues

Difference from passenger trip generation

- Classification of industry
- Type of truck
- Difficulty in the collection of freight data

Critical issues

- Characteristics by the type of industrial park
- Characteristics of firms such as the type of industry, the number of employees and the area of facilities
- Reliability and consistency of freight trip generation data

Chapter 3 Data survey

Data survey

Framework of survey

- Interview : general and logistic characteristics of firms in industrial parks
- Truck count : the number of in- and out- bound freight truck at boundaries
- Truck counting data can be used to validate freight trip generation rate estimated based on the results of interview

The type of industry by firm in industrial parks

Industry	Details
Food/Beverage	Food, beverage and tobacco
Textile/Clothing/Shoes	Textile, clothing, furs, leathers, bags and shoes
Wood/Paper/Printing	Wood, wooden products(excluding furniture), pulp, paper, paper products and printing
Petrochemical	Coke, briquette, petroleum products, chemical products, medical supplies, rubber products and plastic goods
Non-metallic material	Nonmetallic mineral products
Primary metal	Primary metal products
Machinery/Metallic parts	Metalworking products, machine and metallic parts
Electronics/Electricity	Electronic parts, computers, photo, optical and communication equipments, medical and precision instruments and watch
Transportation equipment	Automobiles, trailers and miscellaneous transport equipments
Others	Furniture or fixtures

Data survey

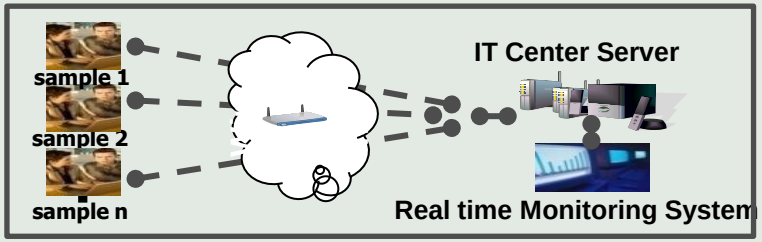
Contents of Interview

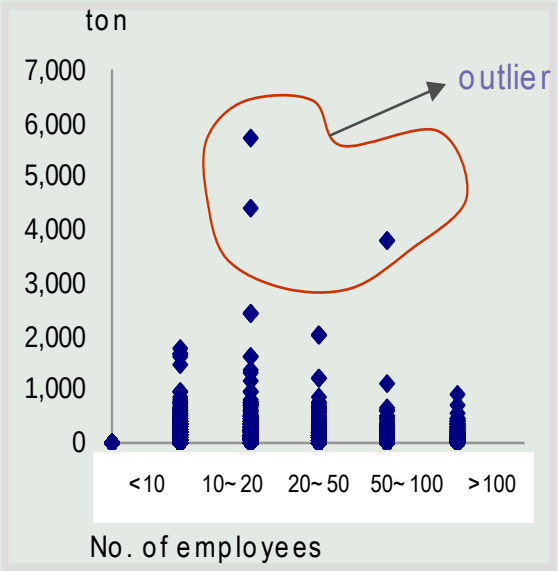
- The type of industry
- the number of employees
- the gross and production area of firm
- Amount of commodity
- in and out bound quantity of goods
- origin and destination of goods
- the type of mode
- the frequency of truck trip

and so on

Survey methods & Quality control

- CAPI (Computer Aided Personal Interview) & PAPI (Paper Aided Personal Interview)





Data survey

Samples

- 5,200 samples are selected out of total 40,000 firms (expected sample rate, 25%)
- Multi-stratified sampling considering the type of industrial park, the type of industry and the size of firms(No. of employees)
  - At the 1st step, samples of industrial parks by the type of industrial park
  - At the 2nd step, sample firms by the type of industry and the size of firms
- Preliminary contacts for 7,848 firms through phone calls
- Carried out 5,277 firms
- Response rate of interviews over 67%

Number of samples responded

	Food/ Beverage	Textile /Clothing/ Shoes	Wood /Paper /Printing	Petro-chemical	Non-metallic material	Primary metal	Machinery/ Metallic parts	Electronics /Electricity	Transp. equipment	Others	Total
National	38	106	135	340	35	168	1,132	444	226	63	2,687
Local	108	303	83	278	38	136	789	316	241	50	2,342
Agro	36	13	9	41	19	-	55	36	34	5	248
Total	182	422	227	659	92	304	1,976	796	501	118	5,277

Data survey

Number of samples responded

number of Employees (person)	Food/ Beverage	Textile /Clothing/ Shoes	Wood /Paper /Printing	Petro-chemical	Non-metallic material	Primary metal	Machinery/ Metallic parts	Electronics/ Electricity	Transp. equipment	Others	Total
~5	3	8	12	29	1	12	153	58	15	7	298
5~10	39	107	61	153	28	75	589	174	71	36	1,333
11~20	48	105	62	156	35	69	594	204	118	33	1,424
21~50	49	132	64	190	12	85	450	205	173	32	1,392
51~100	22	43	21	70	7	35	120	73	67	3	461
100~	21	27	7	61	9	28	70	82	57	7	369
Total	182	422	227	659	92	304	1,976	796	501	118	5,277

Number of contact and contact rate

	Expected sample	Success sample	Contact sample					Number of contact	Rate of Contact Success(%)
			Contact success	Reject	Wrong number	Absence	Total Failure		
National	2,632	2,687	2,839	1,646	2,532	3,758	7,936	10,775	26.3%
Local	2,318	2,342	2,511	823	577	1,910	3,310	5,821	43.1%
Agro	250	248	269	94	42	135	271	540	49.8%
Total	5,200	5,277	5,619	2,563	3,151	5,803	11,517	17,136	32.8%

Chapter 4 Analysis results

Analysis results

Freight trip generation rates by the type of industrial park

- The coefficient of variation (CV): per production area < per employee
- Use of production area as an independent variable -> more strict and stable freight trip generation rates

Freight Trip Generation Rates per Employee by the Type of Industrial Park

Type of industrial park	Inbound			Outbound		
	Mean *(trips)*	Standard Deviation *(trips)*	CV	Mean *(trips)*	Standard Deviation *(trips)*	CV
National	0.11	0.34	3.2	0.11	0.55	5.1
Local	0.11	0.35	3.0	0.11	0.61	5.3
Agro	0.12	0.40	3.4	0.12	0.57	4.9

Freight Trip Generation Rates per 100 m^2 of Production Area by the Type of Industrial Park

Type of industrial park	Inbound			Outbound		
	Mean *(trips)*	Standard Deviation *(trips)*	CV	Mean *(trips)*	Standard Deviation *(trips)*	CV
National	0.5	1.2	2.3	0.5	2.0	3.8
Local	0.5	1.4	2.6	0.5	1.9	3.5
Agro	0.2	0.6	2.6	0.2	0.9	3.6

Analysis results

Freight trip generation rates by industry

- Inbound truck trip generation rate is lower than outbound one and CV is alike
- Freight trip generation rates per employee and unit production area by the type of industry are very different

Freight Trip Generation Rates per Employee by Industry

Industry	Inbound			Outbound		
	Mean *(trips)*	Standard Deviation *(trips)*	CV	Mean *(trips)*	Standard Deviation *(trips)*	CV
Food/Beverage	0.09	0.20	2.2	0.13	0.40	3.2
Textile/Clothing/Shoes	0.08	0.24	3.1	0.09	0.32	3.5
Wood/Paper/Printing	0.12	0.31	2.6	0.19	0.55	2.9
Petro-chemical	0.10	0.34	3.3	0.19	0.67	3.4
Non-metallic material	0.14	0.45	3.1	0.28	1.24	4.5
Primary metal	0.10	0.39	3.9	0.25	0.70	2.8
Machinery/Metallic parts	0.14	0.37	2.6	0.19	0.59	3.0
Electronics/Electricity	0.12	0.37	3.1	0.13	0.37	2.9
Transp. equipment	0.11	0.21	2.0	0.21	0.81	3.8
Others	0.11	0.28	2.6	0.15	0.38	2.6

Freight Trip Generation Rates per 100 m^2 of Production Area by Industry

Industry	Inbound			Outbound		
	Mean *(trips)*	Standard Deviation *(trips)*	CV	Mean *(trips)*	Standard Deviation *(trips)*	CV
Food/Beverage	0.45	1.07	2.4	0.57	1.83	3.2
Textile/Clothing/Shoes	0.18	0.62	3.4	0.28	3.05	11.1
Wood/Paper/Printing	0.30	0.81	2.7	0.65	3.80	5.8
Petro-chemical	0.27	0.91	3.3	0.40	1.16	2.9
Non-metallic material	0.27	0.82	3.0	0.31	0.99	3.2
Primary metal	0.25	1.08	4.2	0.37	1.25	3.4
Machinery/Metallic parts	0.43	1.17	2.7	0.53	1.58	3.0
Electronics/Electricity	0.62	1.52	2.5	0.74	2.06	2.8
Transp. equipment	0.33	0.81	2.5	0.52	1.79	3.4
Others	0.33	0.74	2.3	0.39	0.92	2.4

Analysis results

Validation

- Comparison truck trips counted by counting survey with computed using trip generation rates
- Comparison total absolute differences by the type of industrial park with by the type of industry
- Comparison freight trip generation per production area with number of employees
- Production area is more effective variable than number of employees to explain freight trip generation

Total Absolute Differences between the Number of Truck Trips Obtained by a Counting Survey and Computed by Freight Trip Generation Rates

Applied Trip Rates	Inbound (trips)		Outbound (trips)	
	Number of Employee	Production area	Number of Employee	Production area
By the type of industrial park	76.86	47.64	76.90	47.74
By the type of industry	77.19	43.18	46.88	35.67

Chapter 5 Conclusion

Conclusion

- Desirable to apply freight trip generation rate by the type of industry to estimate freight trip generations
- Use the production area of firm as an independent variable
- Consistent freight trip generation rate of industrial park in Korea
  - Over 25% sample rate based on firms in industrial parks
  - Over 67% response rate
- Improvement of the accuracy of freight trip demand

Future works

- Comparison of the freight trip generation rates among various countries
  - Matching the type of trucks and industry among countries
- Estimation of freight generation rates for other logistic facilities

Thank you

Question ?

Introduction

1 소 제목

- 내용 입력

표 제목

Type of industrial park	내 용	비 고
National		
Local		
Agro		

※ 주 :

그림 제목

Issues

2 소 제목

- 내용 입력

3 소 제목

- 내용 입력

4 소 제목

- 내용 입력