



# Low Carbon Society toward 2050 Project

Data availability and Feasibility in Korea

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# Introduction



- ❖ To check the feasibility of applying the dwelling dynamic model and the transportation model
- ❖ To check the existence of data, reference, data format and etc.
- ❖ To propose further study plan

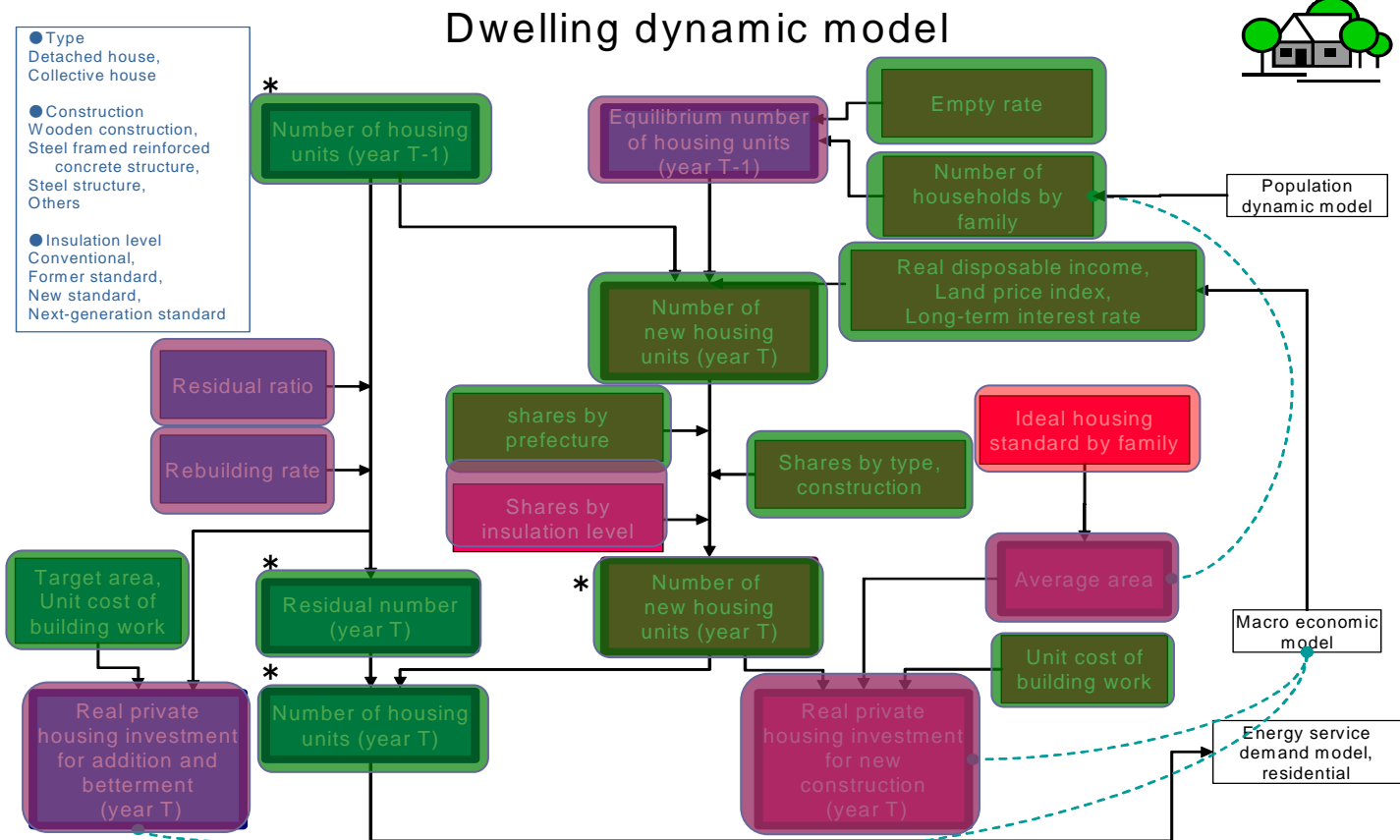
# Dwelling dynamic model



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\* means estimation by prefecture(47), by climate division(6), by type(2), by construction(4), by insulation level(4).

: endogenous variable  
 : exogenous variable

→ : Data flow  
 - - - - - : Consistency assurance

# Dwelling dynamic model



Data		Description	Korea	Data unit, format	Reference	Remarks
	Required data					
a	Number of Households	Number of households by region and family structure.	Number of households by region. (2000)	Number	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	
			Number of persons by family structure.(2000)			
			Number of households by family structure. (prolonged data)		the Ministry of Construction And Transportation <a href="http://www.moct.go.kr/">http://www.moct.go.kr/</a>	
b	Number of dwellings	Number of dwellings including unoccupied dwellings by region, dwelling type, construction type, year of construction.	Number of dwelling by construction type (1990)	Number	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	
			Number of dwelling by region, year of construction (2000)			
			Number of dwelling by region. (prolonged data)		the Ministry of Construction and Transportation <a href="http://www.moct.go.kr/">http://www.moct.go.kr/</a>	
			Number of dwelling by dwelling type(2000)			

# Dwelling dynamic model



c	Number of new-built dwellings	Number of new-built dwellings by region, dwelling type and construction type.	Number of new-built dwellings by region, dwelling type (prolonged data)	Number	the Ministry of Construction and Transportation <a href="http://www.moct.go.kr/">http://www.moct.go.kr/</a>	Difficult to find data about the number of new – built dwellings by construction type ▶
d	Total floor space of new-built dwellings	Total floor space of new-built dwellings by region, dwelling type and construction type	Re-development area of dwelling by region and year Number of housing construction by Floor Space (Apt), region (prolonged data) Number of new-built dwellings by total building area and Building area. (prolonged data) Number of new-built dwellings by floor space and dwelling type. (prolonged data)	m <sup>2</sup> Number Number	the Ministry of Construction and Transportation <a href="http://www.moct.go.kr/">http://www.moct.go.kr/</a> 2005 Year Book of Housing & Urban Statistics Korean National Housing corporation	Difficult to find the total floor space of new-built dwellings There is data of floor space indices and building coverage. ▶
e	Average floor space per dwelling	Average floor space of dwelling stock per dwelling by region, dwelling type, construction type	Number of dwellings by total floor space and dwelling type. (1995,2000)	Number	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	Difficult to find average floor space by construction type. There is data of floor space indices and building coverage. We calculate the average floor space using total floor space and dwelling number ▶

# Dwelling dynamic model



## C. Number of new-built dwellings-Number of new-built dwellings by region, dwelling type

2000	new-built dwellings	Detached houses	Apartments	Row houses	Multiplex houses
number of dwelling					
National	433488	34777	331579	10242	56890
Seoul	96936	2478	72149	2763	19546
Busan	21603	1015	15496	222	4870
Daegu	21033	1959	17358	235	1481
Incheon	20471	687	8956	82	10746
Gwangju	7935	761	7043	8	123
Daejeon	9604	1062	8193	67	282
Ulsan	8670	832	6964	82	792
Kyeonggi	123578	6478	100415	3039	13646
Gangwon	9047	3052	5796	41	158
Chungpuk	12418	1819	10306	231	62
Chingnam	15294	1953	12332	658	351
Jeonpuk	11535	2124	9124	84	203
Jeonnam	15347	2641	11903	389	414
Kyeongpuk	22996	2819	17978	448	1751
Kyeongnam	29923	3843	24879	349	852
Jeju	7098	1254	2687	1544	1613



# Dwelling dynamic model



## D. Total floor space of new-built dwellings-Number of housing construction by Floor Space(Apt)

Item	Year	Total	less than 42.9m <sup>2</sup>	42.9~49.4m <sup>2</sup>	49.5~59.4m <sup>2</sup>	59.4~66.0m <sup>2</sup>
Total	1989	1,236,659	73,998	183,942	215,557	125,394
	1992	1,950,002	118,720	223,005	288,392	164,875
	1995	3,158,754	243,481	260,523	365,563	237,293
	1998	4,543,241	281,117	279,892	466,825	344,880
Seoul	1989	435,969	27,538	44,722	46,201	31,817
	1992	516,966	32,556	48,510	58,300	37,815
	1995	636,504	49,411	53,759	64,836	49,048
	1998	810,728	52,492	57,274	76,485	49,841
Busan	1989	137,006	17,250	15,517	19,450	12,185
	1992	173,237	22,072	17,507	20,658	13,396
	1995	268,793	31,246	23,456	22,773	18,535
	1998	381,959	33,494	23,478	26,305	21,107
Daegu	1989	57,752	1,098	4,404	11,828	7,022
	1992	89,929	5,833	5,850	13,059	8,765
	1995	157,979	14,095	9,651	20,051	12,413
	1998	262,275	14,435	9,822	22,536	14,230





# Dwelling dynamic model



## E. Average floor space per dwellings-Number of dwellings by total floor space, dwelling type, and region.(2000)

		dwelling
23~30m <sup>2</sup>	<b>Total</b>	209018
	<b>Eups</b>	11379
	Detached houses	6145
	Apartments	2297
	Row houses	240
	Multiplex houses	495
	Others	2202
	<b>Myeons</b>	21707
	Detached houses	16837
	Apartments	2116
	Row houses	274
	Multiplex houses	241
	Others	2239
	<b>Dongs</b>	175932
	Detached houses	25376
	Apartments	134510
	Row houses	3298
	Multiplex houses	3978
	Others	8770
	<b>Seoul</b>	44600
	Detached houses	6844
	Apartments	33251
	Row houses	1168
	Multiplex houses	1807
Others	1530	

# Dwelling dynamic model



f	Private housing investment	Disaggregated into investment for new construction and rebuild is desirable.	Gross construction Investment and housing investment (prolonged data)	one billion won	The national statistical office The bank of Korea	It is not disaggregated into investment for new construction and rebuild.
g	Real disposal income		National average income per month (prolonged data)	won	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	
			Average disposal income of worker per month by class (prolonged data)			
h	Long term interest rate	Rate for finance loan over a year.	National housing fund's interest rates on loans	% (per year)	2005 Year Book of Housing & Urban Statistics Korean National Housing corporation	There is also interest rate on loans
i	Index of urban land prices	Index of urban land prices for residential sites	Index of national land prices. Officially Noticed Land Price of City Area	Won per m <sup>2</sup>	Korea association property appraisers <a href="http://kapanet.co.kr/cgi-bin/gsv/">http://kapanet.co.kr/cgi-bin/gsv/</a>	You can purchase a data of national land prices(2001-2006year) from that site.
j	Life time distribution of dwellings	Life time distribution of dwellings by dwelling type and construction type.	A limited term of the reconstruction (Seoul)	year	Homepage of Seoul <a href="http://www.seoul.go.kr/">www.seoul.go.kr/</a>	Difficult to find life time distribution of dwellings by dwelling type and construction type.
k	Coefficient of heat loss	Coefficient of heat loss by dwelling type and construction type.	Passenger	W/m <sup>2</sup> ·k	2003 Guide of Dwelling Insulation repair. Korea Energy Management Corporation	Although there's not coefficient of heat loss by dwelling type and construction type, there are coefficient insulation by region and part of dwelling

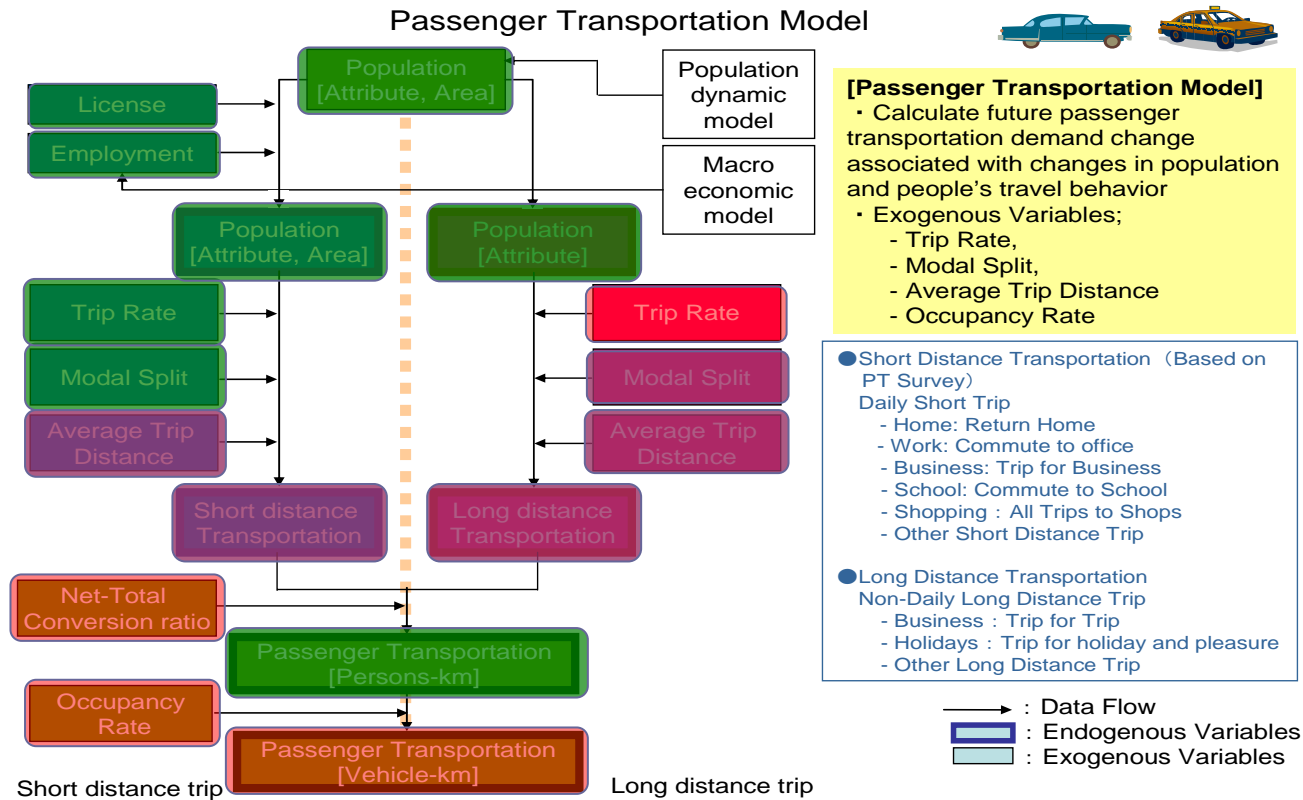
# Passenger Transport Model



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# Passenger Transport Model



Data		Description	Korea	Data unit, format	Reference	Remarks
No	Required data					
a	National or regional transport census and statistics	National or regional transport census and statistics which report passenger transportation volume (passenger, passenger-km, vehicle-km). These data are used to verify and calibrate the model	National transport statistics which report passenger transportation volume by mode	passenger,	Korea transport database <a href="http://www.ktdb.go.kr/">http://www.ktdb.go.kr/</a>	Difficult to find vehicle-km data
				passenger-km	The Ministry of Construction and Transportation <a href="http://www.moct.go.kr/">http://www.moct.go.kr/</a>	
b	Person trip survey data	A person trip survey(PT)is a survey on personal travel behavior. PT data describes number of trips people make in a day, length or duration of each trip by people category, trip purpose and mode	Number of passengers by trip purpose, mode, region, and people category.	Number	Korea transport database <a href="http://www.ktdb.go.kr/">http://www.ktdb.go.kr/</a>	
			Average length and duration of trip by region, trip purpose, mode.	Length : km Duration : minute	Korea transport database <a href="http://www.ktdb.go.kr/">http://www.ktdb.go.kr/</a>	
c	Person trip survey data for long distance trip	In the case you collect metropolitan PT, another PT which includes long distance trip is required in addition.	Number of passengers by mode during the summer vacation	Number	The Korea transport institute	Difficult to find data of other long distance trip
			Number of passengers by mode, duration by mode during holiday.	Number Duration : hour		

# Passenger Transport Model




## C. Person trip survey data for long distance trip-Number of passengers and cars during summer vacation

unit	passenger	passenger	passenger	passenger	passenger	cars
mode	express bus	train	airplane	water transport	bus	passenger car
2000	4,832,972	8,971,446	2,247,598	1,969,300	35,869,344	40,731,258
2001	3,787,000	8,573,000	1,776,000	1,389,000	20,849,000	62,072,000
2002	3,441,000	8,863,000	1,565,000	1,421,000	31,106,000	67,757,000
2003	3,309,000	8,020,000	1,176,385	1,724,038	30,257,322	75,129,102

# Passenger Transport Model



d	Modal speed	Average driving speed (km/h) of each mode. It is possibly included in census and statistics mentioned above.	Average driving speed of passenger car and bus by times.	Km /h	The Korea transport institute	Difficult to find average driving speed by other mode 
e	Occupancy rate	Occupancy rate is a number which is computed as person-km per vehicle-km.	Number of passenger by vehicle type and region (2001)	Number	MOCIE(2002) Energy consumption Survey	
f	Demographic data	Residential area	Number of persons who live in rural by region	Number	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	It includes data of the total population of Korea.
		Sex	Number of male and female by region	Number		
			Sex ratio	%		
		Occupation	Number of persons employed and unemployed	Number	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	
		Car availability	Number of cars are registered by region and mode.	Number	the Ministry of Construction and Transportation <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>	
Number of households own passenger car by region, mode and the number of cars	The national statistical office <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>					
Car license	Number of persons have a car license by region and mode.	Number	the Ministry of Construction and Transportation <a href="http://kosis.nso.go.kr/">http://kosis.nso.go.kr/</a>			

# Passenger Transport Model



## D. Modal speed-Average driving speed

	mode	time	average driving speed (km/h)			
			a weekday		a weekend	
			the downtown	the outskirts of a city	the downtown	the outskirts of a city
region gwang ju	passenger car	peak time in the morning	49.7	68.5	51.2	72.9
		not peak time in the morning	50.2	67.6	50.8	69.6
		peak time in the afternoon	48	68	49.9	68.3
	bus	peak time in the morning	47	65.3	47.2	69.5
		not peak time in the morning	47.4	61.3	46.8	67.6
		peak time in the afternoon	45.9	68.6	46.3	62.3

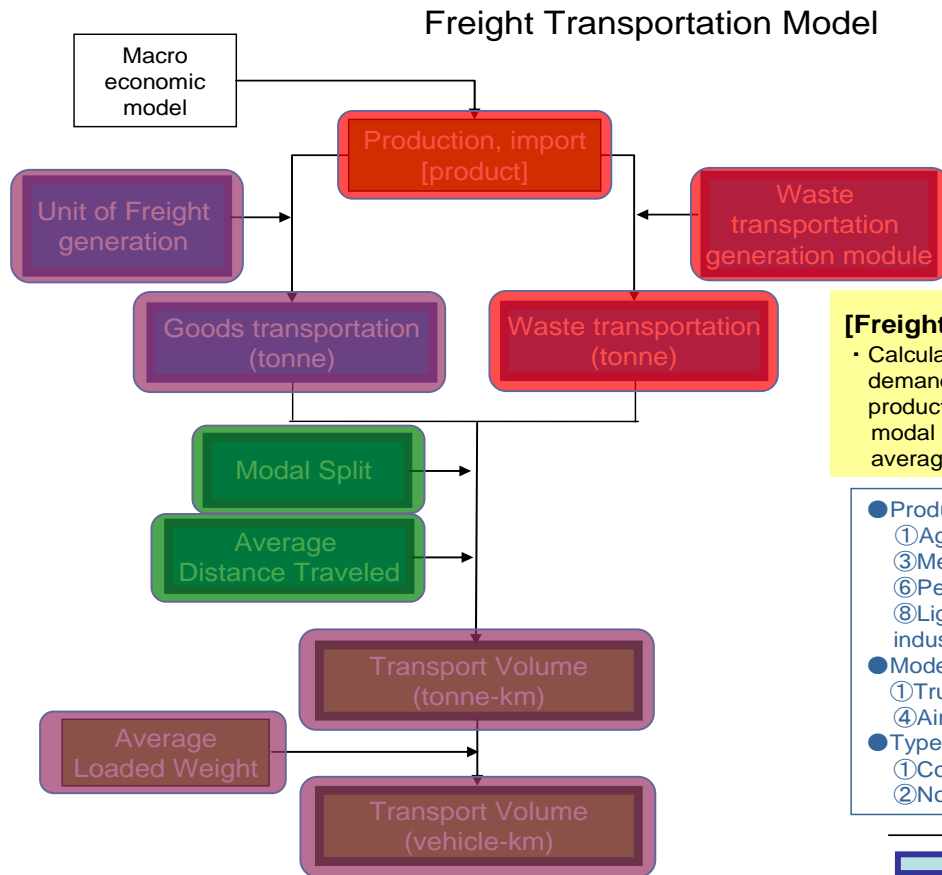
# Freight Transportation Model



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**[Freight Transportation Model]**

- Calculate future freight transportation demand associated with changes of production, import, unit of freight generation, modal split, average distance traveled and average loaded weight

- Product
  - ①Agricultural products②Minerals
  - ③Metals④Machineries⑤Ceramics
  - ⑥Petroleum products,⑦Chemicals
  - ⑧Light industries⑨Miscellaneous industries⑩Waste
- Mode
  - ①Truck②Train③Water Transport
  - ④Airplane
- Type(truck)
  - ①Commercial or Private
  - ②Normal size or Small size

→ : Data Flow  
   : Endogenous Variables  
   : Exogenous Variables



# Freight Transportation Model



Data		Description	Korea	Data unit, format	Reference	Remarks
g	Unit of freight generation	Unit of freight generation is computed as amount of freight (ton) per amount of production and import (\$). This data is needed for each production shown in 5) except waste. National level data of freight transport volume (tonne), production (\$) and import (\$) is desirable. However, regional data is also useful.	Freight transport volume of domestic air service	tonne/product	The Korea Transport Institution <a href="http://www.koti.re.kr/">http://www.koti.re.kr/</a>	Difficult to find details about production and import.
			Freight transport volume of international air service	tonne	The Korea Transport Institution <a href="http://www.koti.re.kr/">http://www.koti.re.kr/</a>	
			In bound freight transport volume	\$, tonne	The Korea Transport Institution <a href="http://www.koti.re.kr/">http://www.koti.re.kr/</a>	
h	Amount of waste transportation	Amount of waste which is transported in a year	amount of waste	Tonne/day	Ministry of Environment <a href="http://www.me.go.kr/">http://www.me.go.kr/</a>	Just exist amount of waste data, Difficult to find data about transported waste
i	Modal split	Modal split is share of each mode for each product shown in 5) in tonnes. For example, in the case 1000 tons of metals are transported by small truck while 9000 tons are by other modes, small truck's modal split of metal is 10%.	percentage of transported freight by transport type	%	The Korea Transport Institution <a href="http://www.koti.re.kr/">http://www.koti.re.kr/</a>	
			percentage of transported freight by two industry and production	%	The Korea Transport Institution <a href="http://www.koti.re.kr/">http://www.koti.re.kr/</a>	

# Freight Transportation Model



## H. Amount of waste transportation - amount of waste

	1996	1997	1998	1999	2000	2001	2002	2003
<b>Total</b>	<b>175,334</b>	<b>189,200</b>	<b>184,989</b>	<b>211,728</b>	<b>226,668</b>	<b>252,927</b>	<b>269,548</b>	<b>295,047</b>
<b>General waste</b>	<b>49,925</b>	<b>47,895</b>	<b>44,583</b>	<b>45,614</b>	<b>46,438</b>	<b>48,499</b>	<b>49,902</b>	<b>50,736</b>
<b>Commercial waste</b>	<b>96,984</b>	<b>93,528</b>	<b>92,713</b>	<b>103,893</b>	<b>101,453</b>	<b>95,908</b>	<b>99,505</b>	<b>98,891</b>
<b>Construction waste</b>	<b>28,425</b>	<b>47,777</b>	<b>47,693</b>	<b>62,221</b>	<b>78,777</b>	<b>108,520</b>	<b>120,141</b>	<b>145,420</b>

# Freight Transportation Model



j	Average distance traveled	Average distance traveled is a number computed as tonne-km per tonne. Data by each mode and each product is desirable. At least, data for each mode is necessary	Average distance by loading capacity (truck)	tonne-km	The Korea Transport Institution <a href="http://www.koti.re.kr">http://www.koti.re.kr</a>	
			Average distance by production(train)	production -km	The Korea Transport Institution <a href="http://www.koti.re.kr">http://www.koti.re.kr</a>	
			Average distance by industrial classification	industrial classification-km	The Korea Transport Institution <a href="http://www.koti.re.kr">http://www.koti.re.kr</a>	
k	Average loaded weight	Average loaded weight is a number computed as tonne-km per vehicle-km. Data for each mode is needed..	Average loaded by loading capacity(private truck)	tonne-km	The Korea Transport Institution <a href="http://www.koti.re.kr">http://www.koti.re.kr</a>	Just exist truck data, Difficult to find data about average loaded weight by vehicle classification
			Average loaded by loading capacity(commercial truck)	tonne-km	The Korea Transport Institution <a href="http://www.koti.re.kr">http://www.koti.re.kr</a>	
L	Economic Data	Amount of production and import in monetary unit per year for each product category shown in 5). Input-Output table may be the source.				Just exist some of export data

# Freight Transportation Model



## K. Average loaded weight - Average loaded by loading capacity (commercial truck)

Loading capacity	distance-km (loaded)	distance-km (empty)	Time-minute (loaded)	time-minute (empty)	Average ton
under 1ton	45.2	30.1	87.6	56.1	0.8
under 3ton	33.5	33.5	83	58.2	2.2
under 5ton	159.7	118.2	279.4	178.7	4.3
under 8ton	92.9	71.2	143.1	119.2	4.7
under 10ton	209.7	107.4	286.1	166.2	6
under 12ton	159.9	61.7	266.7	99.1	10.3
over 12ton	158.4	116.9	254.5	167.8	18.5
Total	130.6	76.5	208.1	118.3	9

# Further Study



- **To complete unfinished data**
- **To project socio-demographic data**
- **To assess the feasible policy options for the low carbon society**
- **To set the long term target**



Thank You!

