

Children's Independent Travel and the Built Environment

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Current Issue

- Children's travel in developed countries is increasingly by automobile (Hillman, 1991; McDonald, 2006) .



Results

- What are factors associated with an increase in children's independent travel?
 - Distance
 - Late trips
 - Seeing a known person during independent travel from origin to destination.

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Children in Japan Retain High Independent Mobility

- The percentage of independent trips across all days was high.
- But, it differed by area:

% of all trips that are independent on that day	Weekday	Saturday	Sunday
Farm area (689 ppl/km ²)	58.6%	-	13.8%
Town area (2144 ppl/km ²)	47.0%	33.2%	21.5%
City area (2035 ppl/km ²)	91.6%	-	53.0%
City area 2 (5825 ppl/km ²)	87.6%	44.1%	20.3%
High density city (10,811 ppl/km ²)	90.9%	-	31.0%

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Analyzing Independent Trips

- Independent trip: An adult is not present in any part of the trip, no matter the length.
- Assume children made all desired trips.
 - Ignore children who made no trips.
 - Take percent of trips that are independent as the dependent variable.
 - Ex: 3 Independent trips out of 4 trips = 75% independent.
- Neighborhood built environment factors are important in determining initial options.
 - Measure explanatory variables on a neighborhood level (1 km² around the center of the child's postal code).

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Explanatory Variables

- Safety
 - Traffic
 - Traffic factors for each neighborhood that consider volume and speed. (Volume x speed)
 - People
 - Seeing a known person during travel between origin and destination.
- Other
 - Boy dummy
 - Area dummy

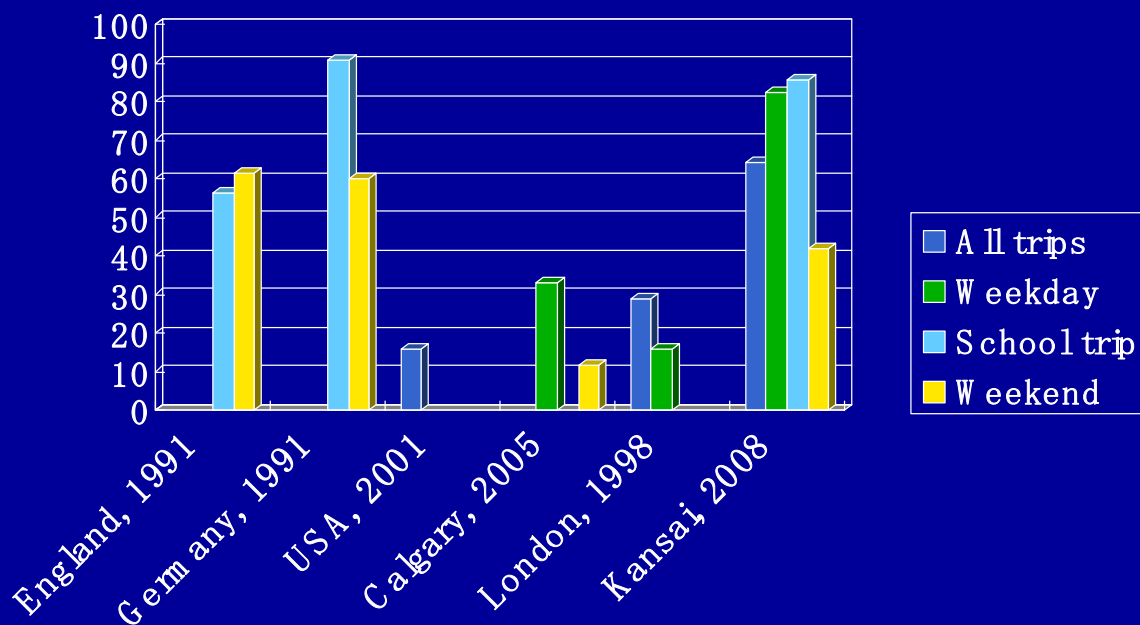
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Explanatory Variables (P.2)

- Distance: perceived far (Y/N)
- Transportation Facilities in neighborhood:
 - Train stations (headway < 20min.),
 - Buses (service frequency varies),
 - Sidewalks total length,
 - Roads under 8m wide total length,
 - Roads over 8m wide total length,
 - Intersections,
 - Household car ownership.

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Independent Travel



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Children's Travel Diary 1/2

Trip Diary Assigned Number

1 **Date** ___m/___d | 3 **Weather**

2 **Time** ___:___
Leaving time

4 **Where are you going?**

Home Someone else's School Cram school A park A restaurant

Temple or shrine After school program Convenience store Shopping area Place name Other:

5 **Distance**

Far Near (*10-15 min.walk)

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Children's Travel Diary 2/2

6 **How are you going there?**

** (mode) A:Walk B:bicycle C:Train D:Bus E:Car F:Other

By()for() mode min. → By()for() mode min. → By()for() mode min. → By()for() mode min. →

(1) destination (2) destination (3) destination (4) destination

→ By()for() mode min. → By()for() mode min. → By()for() mode min. → *Please write about your walks too!

(5) destination (6) destination (7) destination

7 **Who are you going with?**

Friend(s) Father Mother Known Adult Other:

8 **Who did you see?**

Known child Known adult People I don't know

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Kansai Area of Japan

- Average population density: 1975 ppl/km².
- Residential population: 18.2 million
- Household car ownership average: 0.97
 - 0.5 in urban areas up to 1.37 in emerging areas.



Source: www.discover-japan.info/gettingthere_maps_kansai.htm

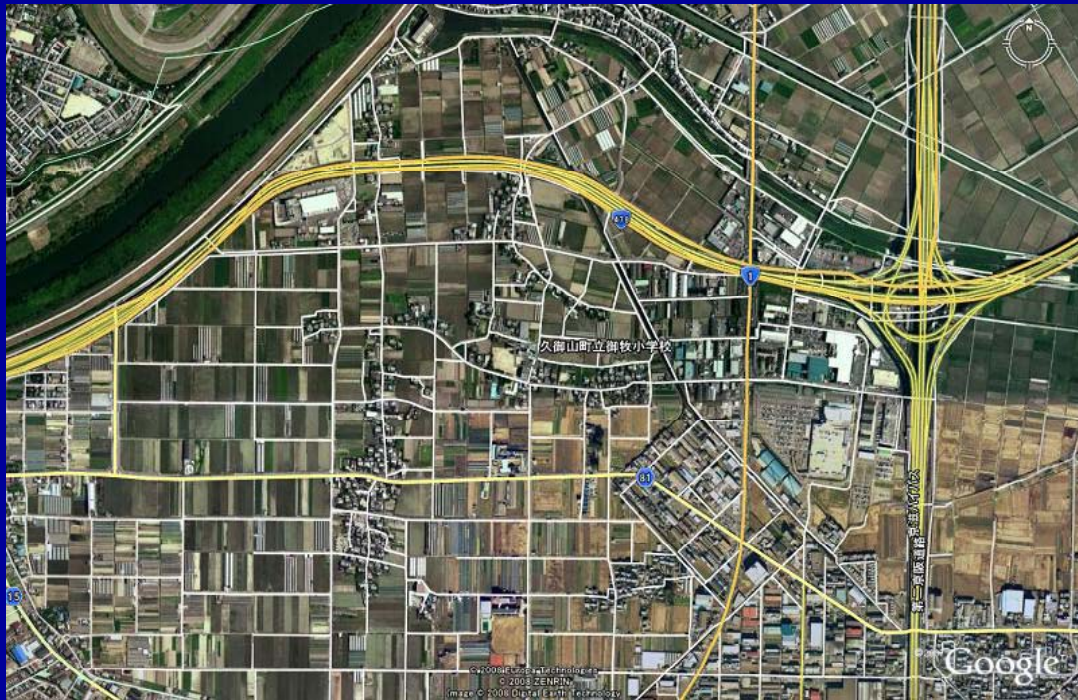
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Study Areas

	Farm Area (n=35)	Town Area (n=39)	City Area (n=106)	City Area 2 (n=111)	High Density (n=100)
Boys	57.1%	53.9%	42.5%	52.2%	50.0%
Car ownership	1.86	1.51	1.40	1.23	0.97
Population Density (ppl/km ²)	688.9	2143.9	2035.3	5825.5	10811.2

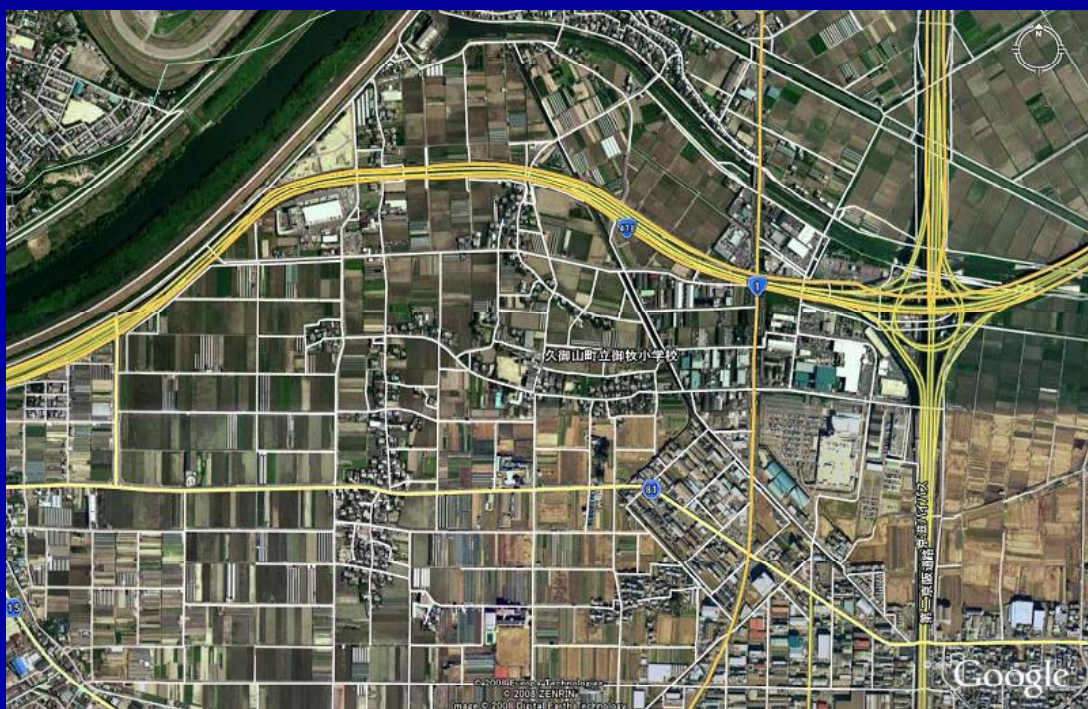
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Farm area



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Town area



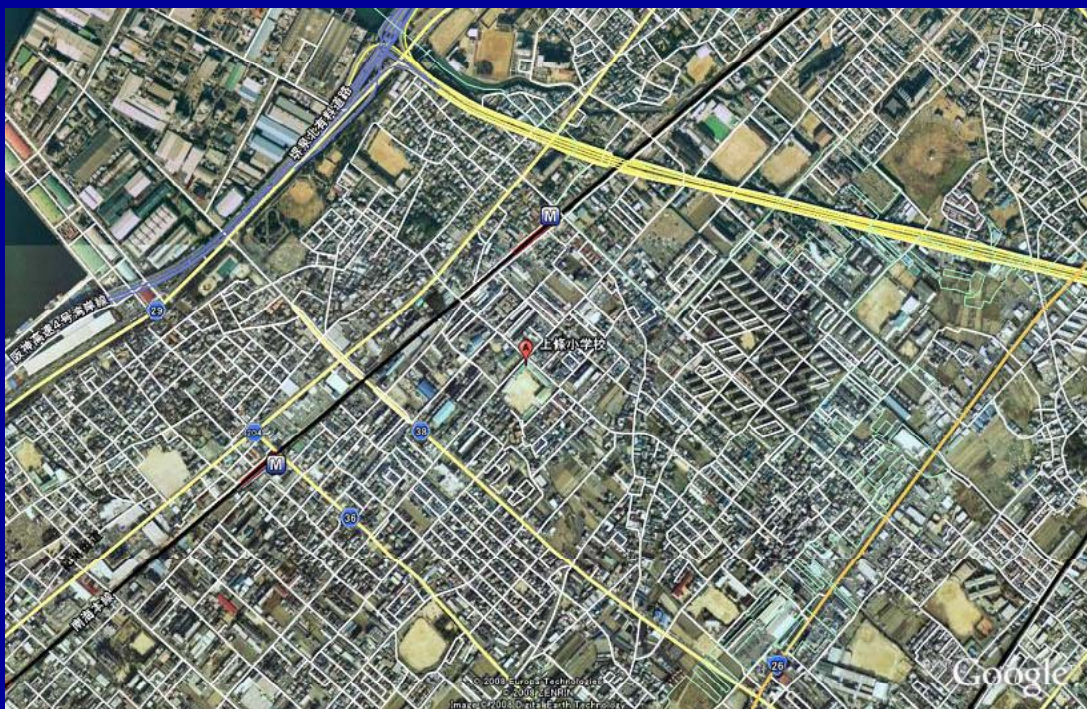
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Mid-Density City #1



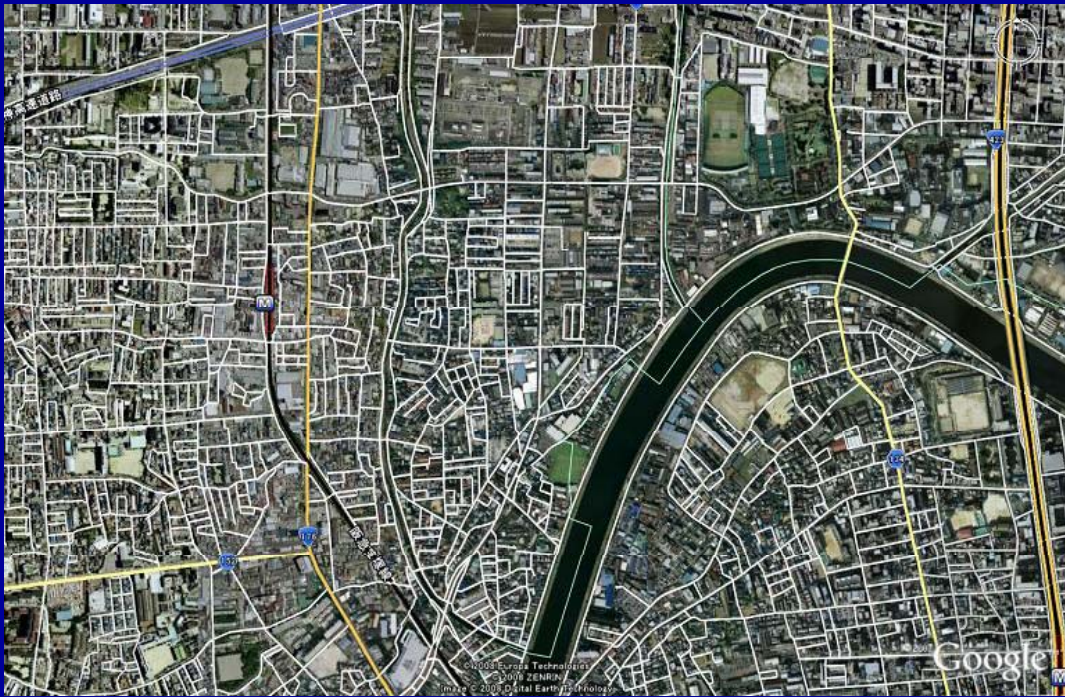
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Mid-Density City #2



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High-Density



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Data

- Weekdays have school trips, which are all walking AND independent, regardless of area.
 - Therefore, only use trips after school commute.
- Saturday
 - Insufficient data.
- Sunday
 - No school obligations.
 - However, parents may have more free time, increasing automobile trips.

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Results

Variable	t value		p value	
	Sunday	After School	Sunday	After School
Constant	5.15	0.49	0	0.625
Percent of trips that were far	-9.67	-1.519	0	0.13
Percent of trips that were after 8pm	-2.65	-3.053	0.01	0.003
Traffic factor (volume x speed)	0.83	1.825	0.41	0.069
Percent of independent trips where a known person was seen	6.49	3.768	0	0
Boy dummy	0.9	0.778	0.37	0.437
Household car ownership	-1.27	0.317	0.21	0.752
Sidewalk length (m)	-1.52	-0.754	0.13	0.452
Number of buses	0.28	-0.24	0.78	0.811
Number of train stations	0.63	-0.139	0.53	0.889
Intersections	0.16	0.434	0.87	0.664
4-way intersections percentage	-2.06	-1.222	0.04	0.223
High-density school dummy	-0.71	-0.188	0.48	0.851
Rural schools dummy	-0.65	-0.282	0.52	0.778
Population Density (p/km ²)	-0.6	-1.01	0.55	0.314
Length of roads less than 8m wide (m)	-0.4	1.653	0.69	0.1
Length of roads greater or equal to 8m (m)	0.014	0.014	0.49	0.989

Sunday: N = 262; R² = 0.548 After School: N = 231; R² = 0.277

Discussion

- Distance (**negative association**) on Sundays
 - Mixed land-use which allows for services to be closer.
- Late trips (**negative association**)
- Seeing a known person (**positive association**)
 - Increase community cohesion.
 - Increase pedestrian and cycling traffic.

Sociological Considerations

- Social factors may be difficult to measure, but are likely important considerations.
- Adults in German culture can discipline unknown children in public.
 - Explanation for difference in independent travel between German and English youths (Hillman et al., 1991)
- This study showed that the presence of known people on the streets is important.

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Thank you.

Are there any questions?

Sunday: Reduced Equation

Variable	t value	p value
Constant	11.146	0
Percentage of trips that are far (perceived < 15min. Walk)	-10.207	0
Percentage of trips that are after 8pm.	-2.718	0.007
Traffic factor (volume x speed)	-0.705	0.481
Percentage of independent trips where a known person was seen	7.048	0
Boy dummy	0.443	0.658
Household car ownership	-1.53	0.127
High density area dummy	-1.995	0.047
rural area dummy	-3.28	0.001
Population density	-3.745	0

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N: 278; DF: 9, 269; R²: 0.515; F value: 31.68

Weekday: Reduced Equation

Variable	t value	p value
Constant	6.148	0
Percentage of trips that are far (perceived < 15min. Walk)	-1.683	0.094
Percentage of trips that are after 8pm.	-3.158	0.002
Traffic factor (volume x speed)	0.939	0.349
Percentage of independent trips where a known person was seen	3.987	0
Boy dummy	0.813	0.417
Household car ownership	0.046	0.963
High density area dummy	-2.645	0.009
rural area dummy	-2.774	0.006
Population density	1.732	0.085

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N: 278; DF: 9, 269; R²: 0.515; F value: 31.68

Sunday Independent Trip Percentages

Population Density (ρ)	Average	Standard Deviation	N
$\rho < 2000$ ppl/km ²	.167	.051	34
$2000 \leq \rho < 4000$ ppl/km ²	.205	.049	37
$4000 \leq \rho < 6500$ ppl/km ²	.216	.032	87
$6500 \leq \rho$ ppl/km ²	.311	.045	44

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Weekday Independent Trip Percentages

Population Density (ρ)	Average	Standard Deviation	N
$\rho < 2000$ ppl/km ²	.538	.044	37
$2000 \leq \rho < 4000$ ppl/km ²	.659	.044	36
$4000 \leq \rho < 6500$ ppl/km ²	.843	.022	144
$6500 \leq \rho$ ppl/km ²	.843	.025	115

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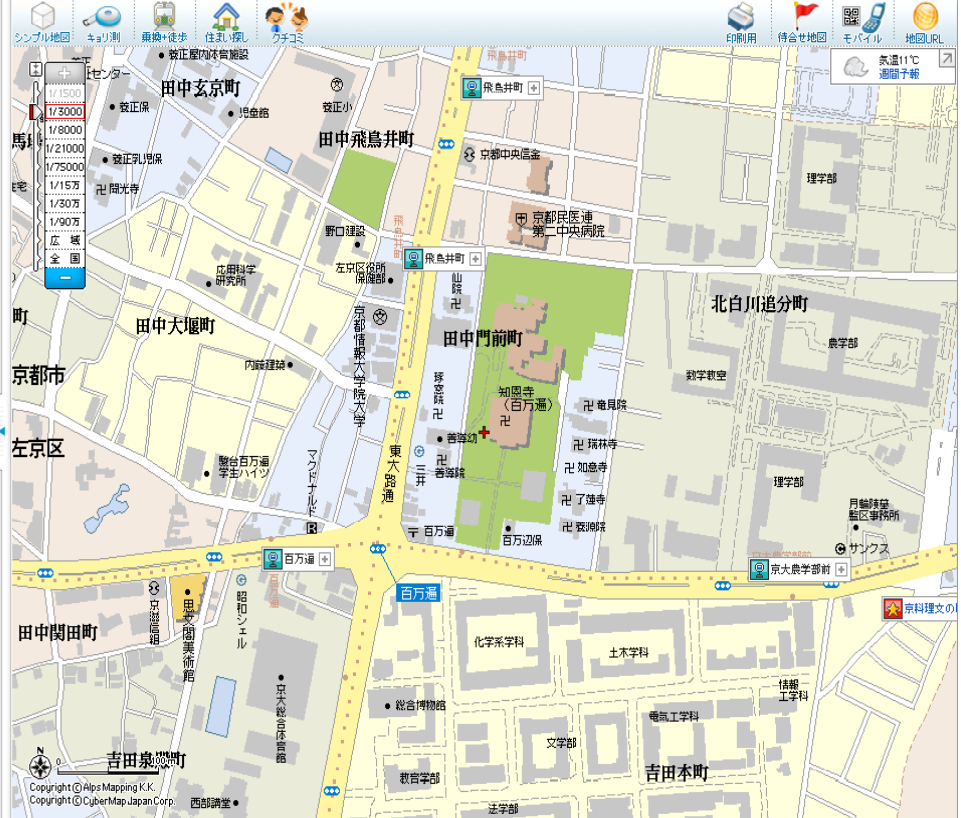
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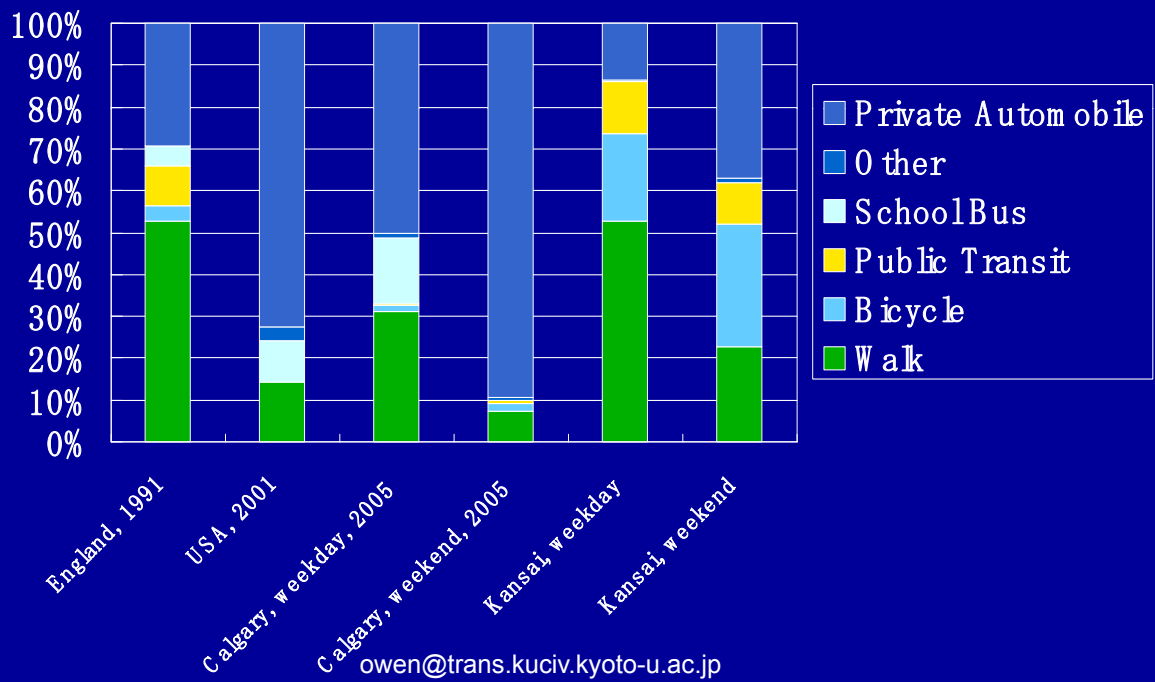
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Mode Split Comparison



Mixed Land-Use



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Zoned - Separate Use



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