



# **Impact of Transport Infrastructure on Land Use Change in Medium-sized Cities**

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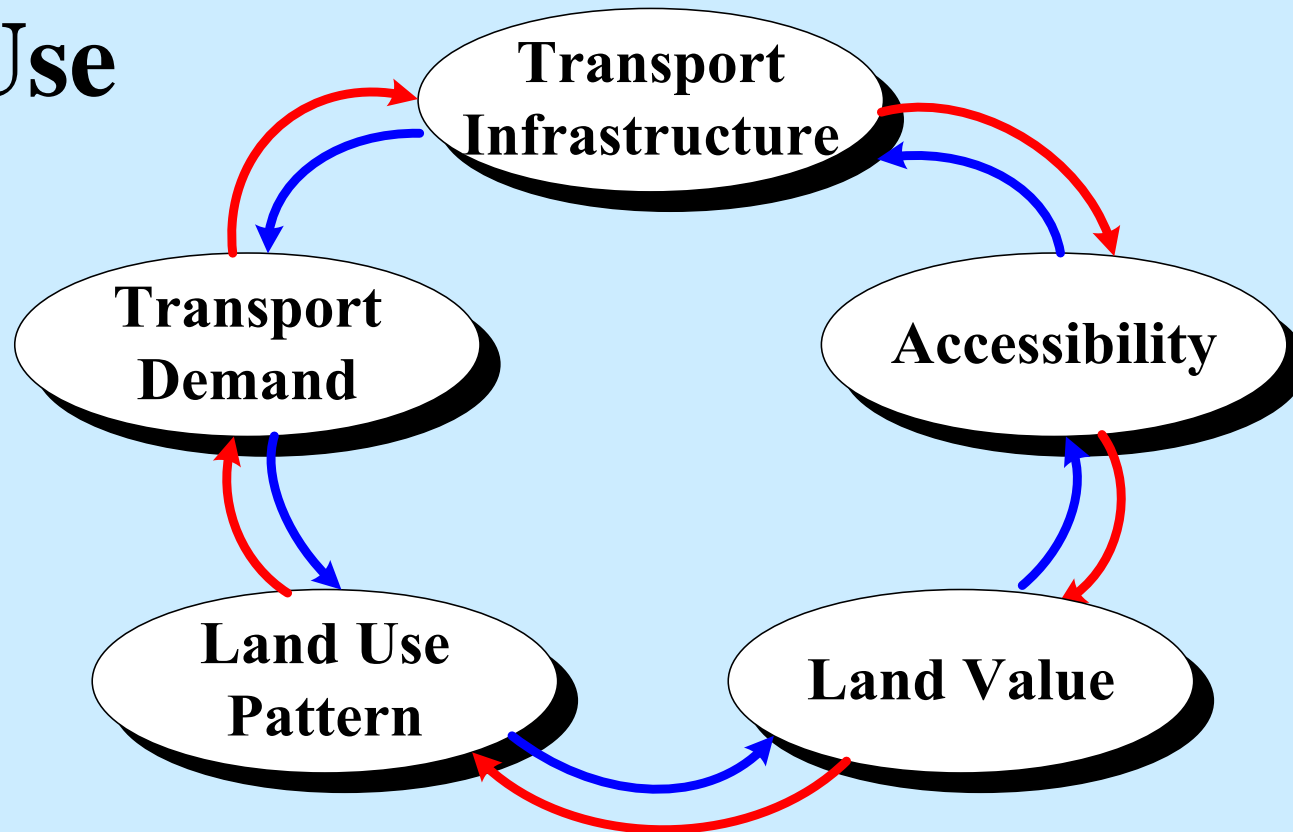
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National Chiao Tung University**

# *Introduction (1/5)*

## ➤ Interaction between Transport and Land Use





## ***Introduction (2/5)***

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- **Transport Infrastructure: Freeway**
- **Land Use Change: Population Distribution, Land Use Pattern, Industry Development**
- **Medium-Sized City:**
  - ❑ Yilan County (0.46 million)
  - ❑ Nantou County (0.53 million)
  - ❑ Pingtung County (0.89 million)



# ***Introduction (3/5)***

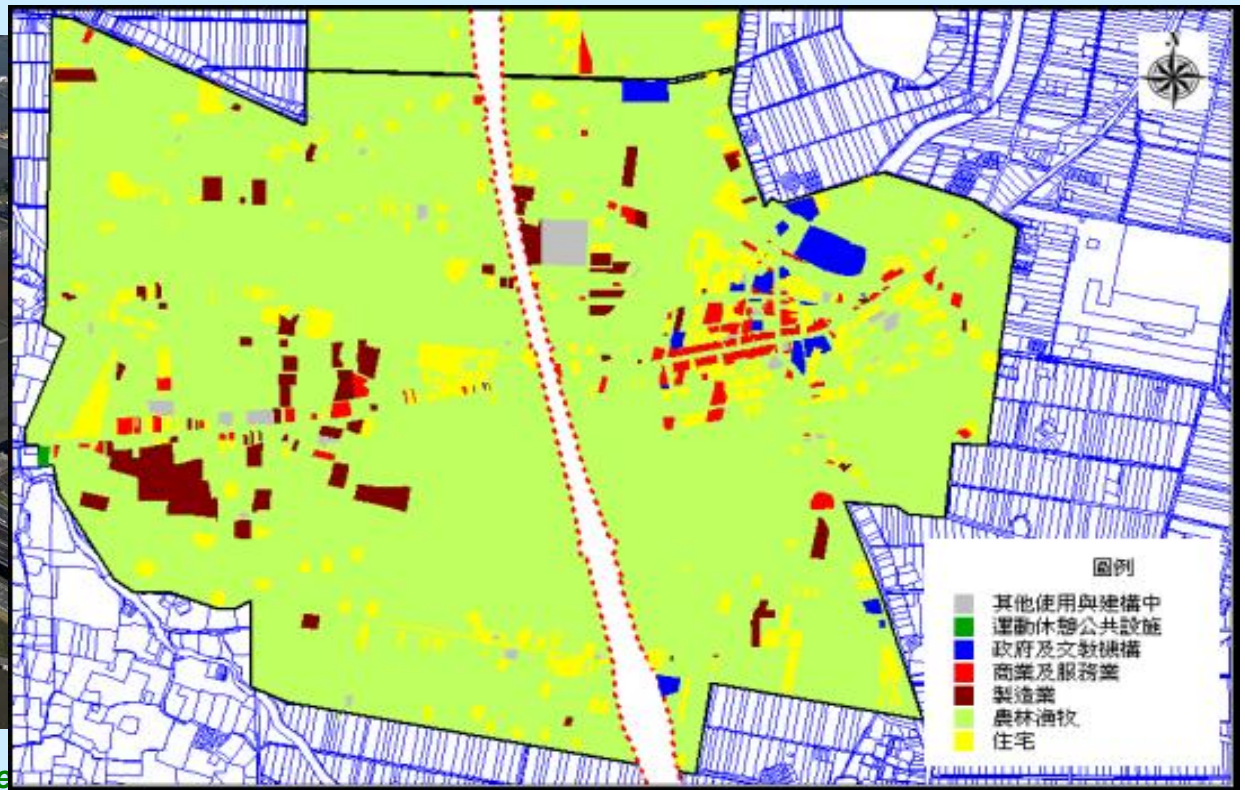
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- **Does freeway have impacts on population distribution?**



# *Introduction (4/5)*

➤ Does freeway have impacts on land use pattern?



# ***Introduction (4/5)***

- **Does freeway have impacts on industry development?**



## *Background (1/2)*

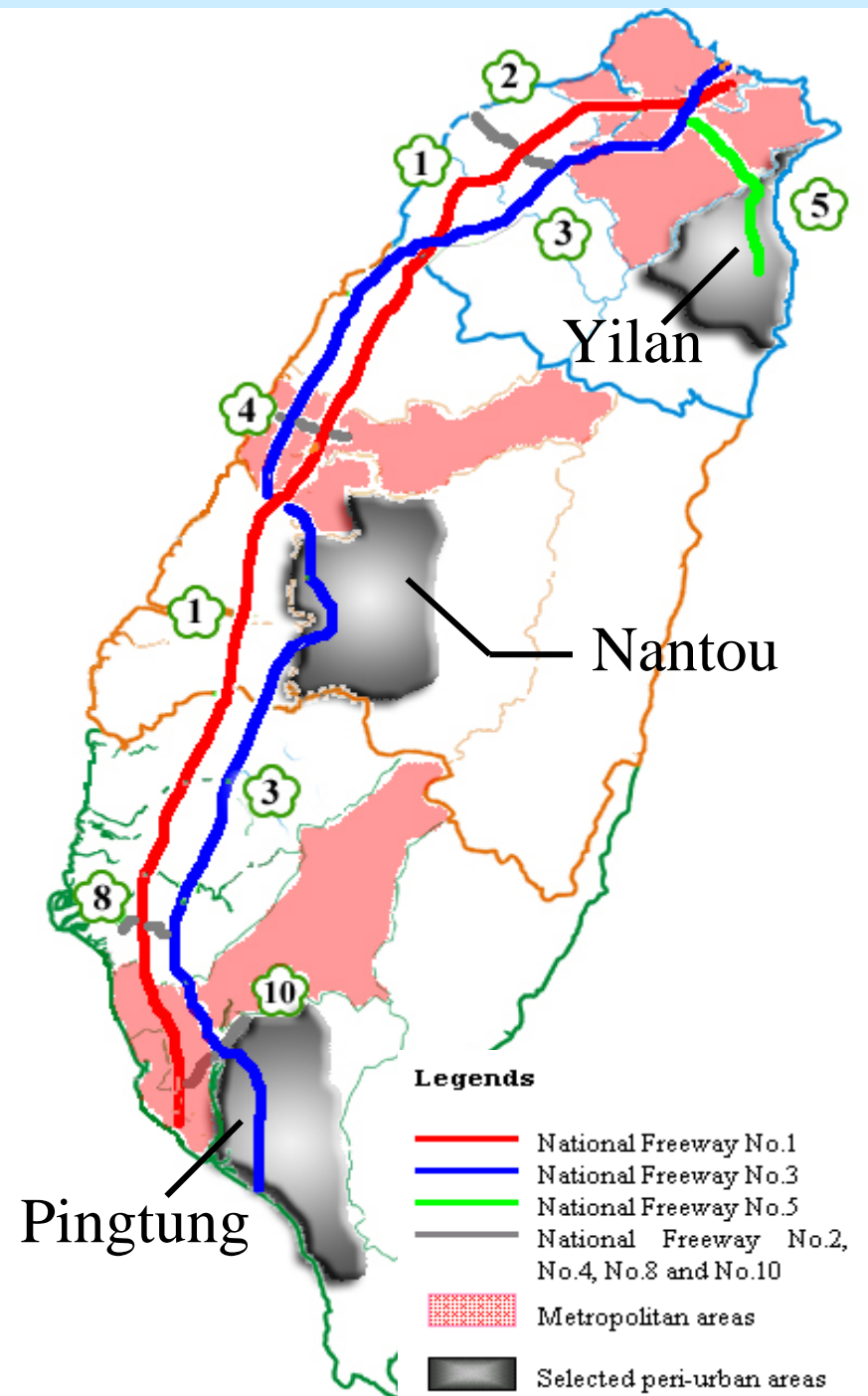
### ➤ Freeway: bridge rural and urban areas

#### □ No.3

- Completed in 2004
- 431.5 km

#### □ No.5

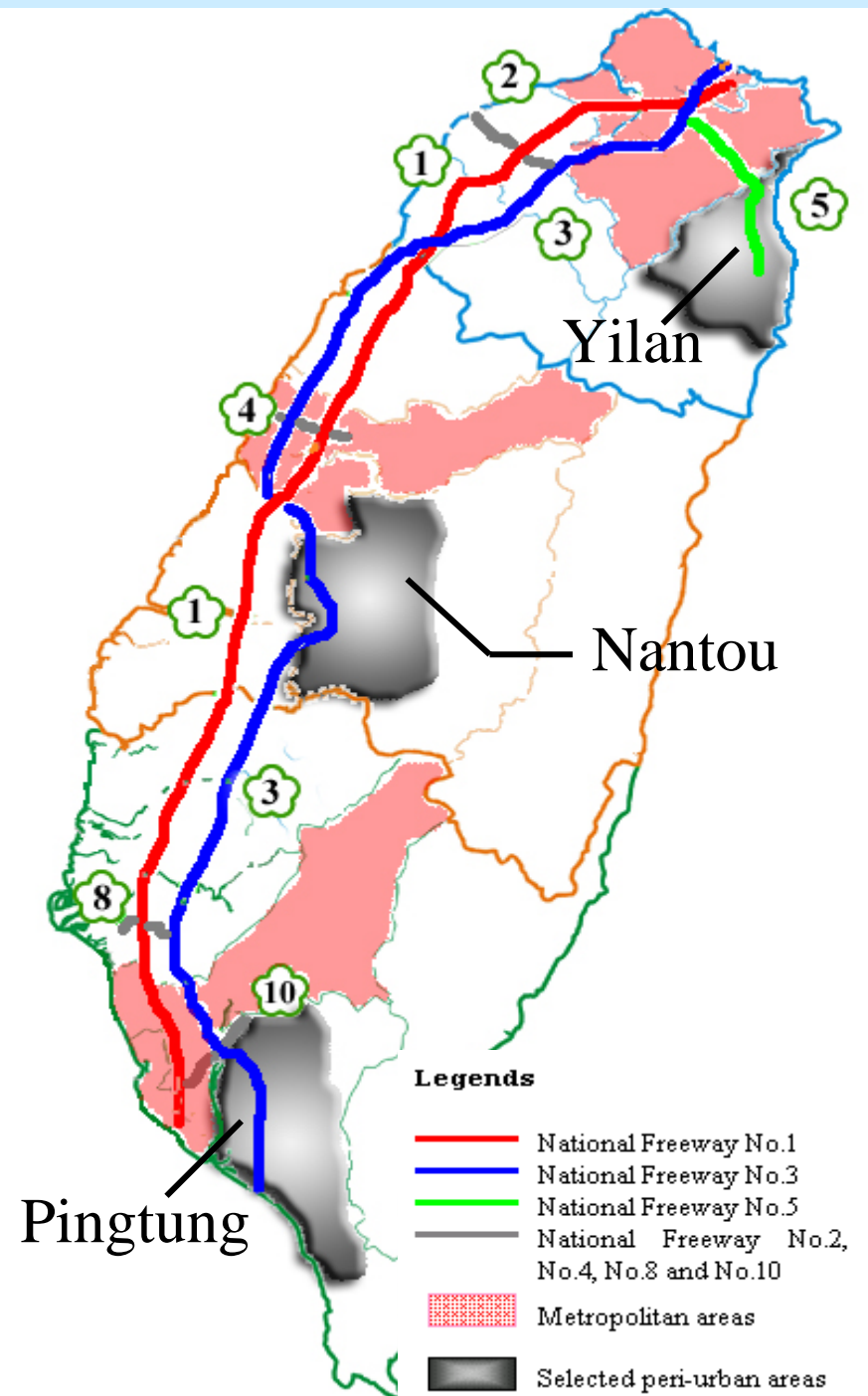
- Completed in 2006
- 54.3 km
- 12.9 km long Hsuehshan Tunnel



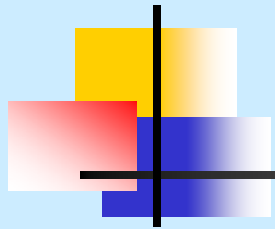
## *Background (2/2)*

### ➤ Peri-urban area

- ❑ Be adjacent to metropolitan areas
- ❑ Connect neighboring metropolitan area via a single freeway
- ❑ Yilan, Nantou and Pingtung sharing similar socio-economic characteristics are selected as the study areas.







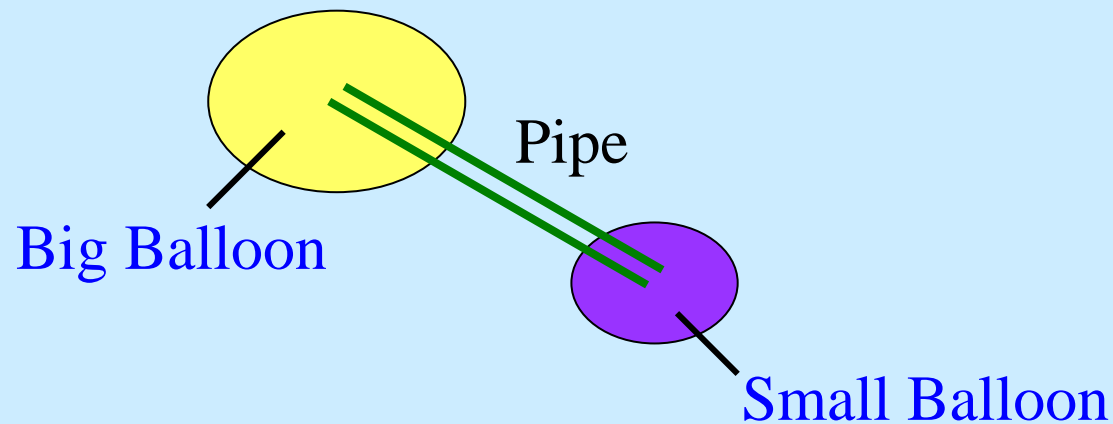
# *Questions*

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Will air go from **big balloon** to **small balloon**?

or

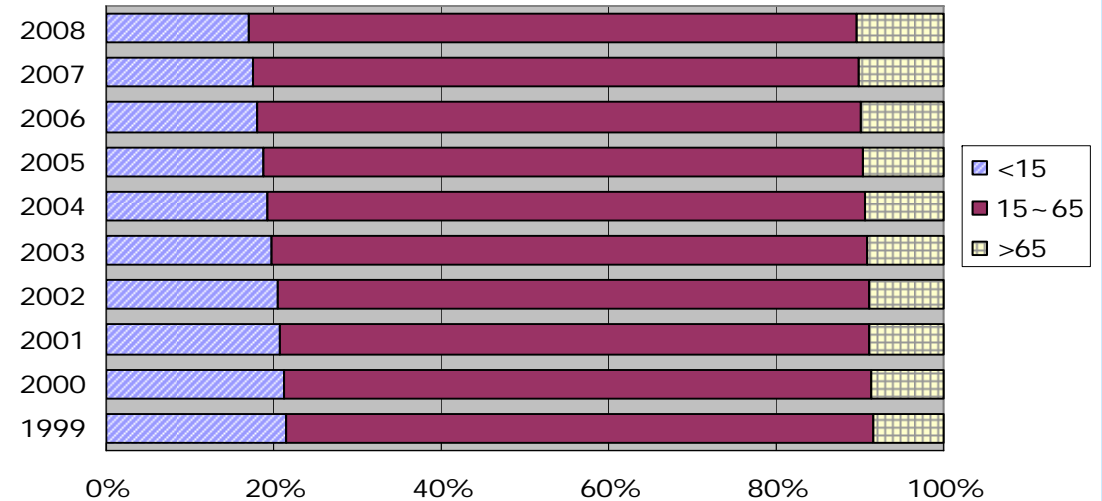
Will air go from **small balloon** to **big balloon**?



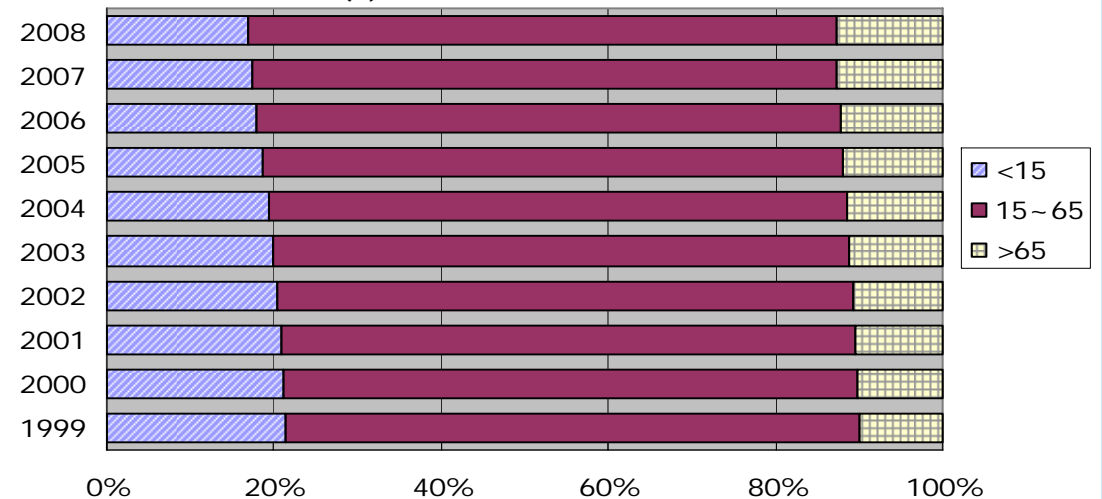
# Results (1/11)

- Similar baby bust between the peri-urban areas and the whole Taiwan
- Much higher aging society in “Agricultural County” (our study area)

(A) Taiwan Overall

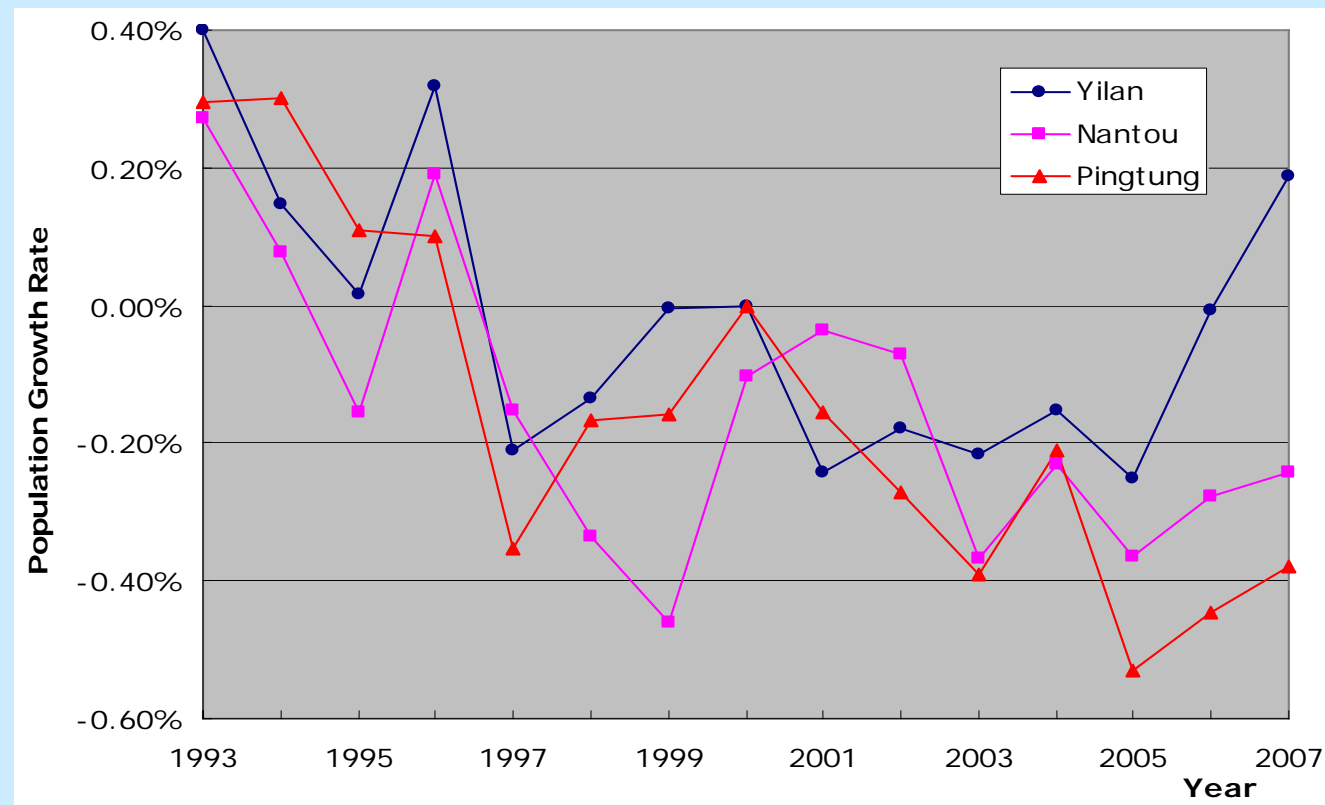


(B) Research Peri-Urban Areas



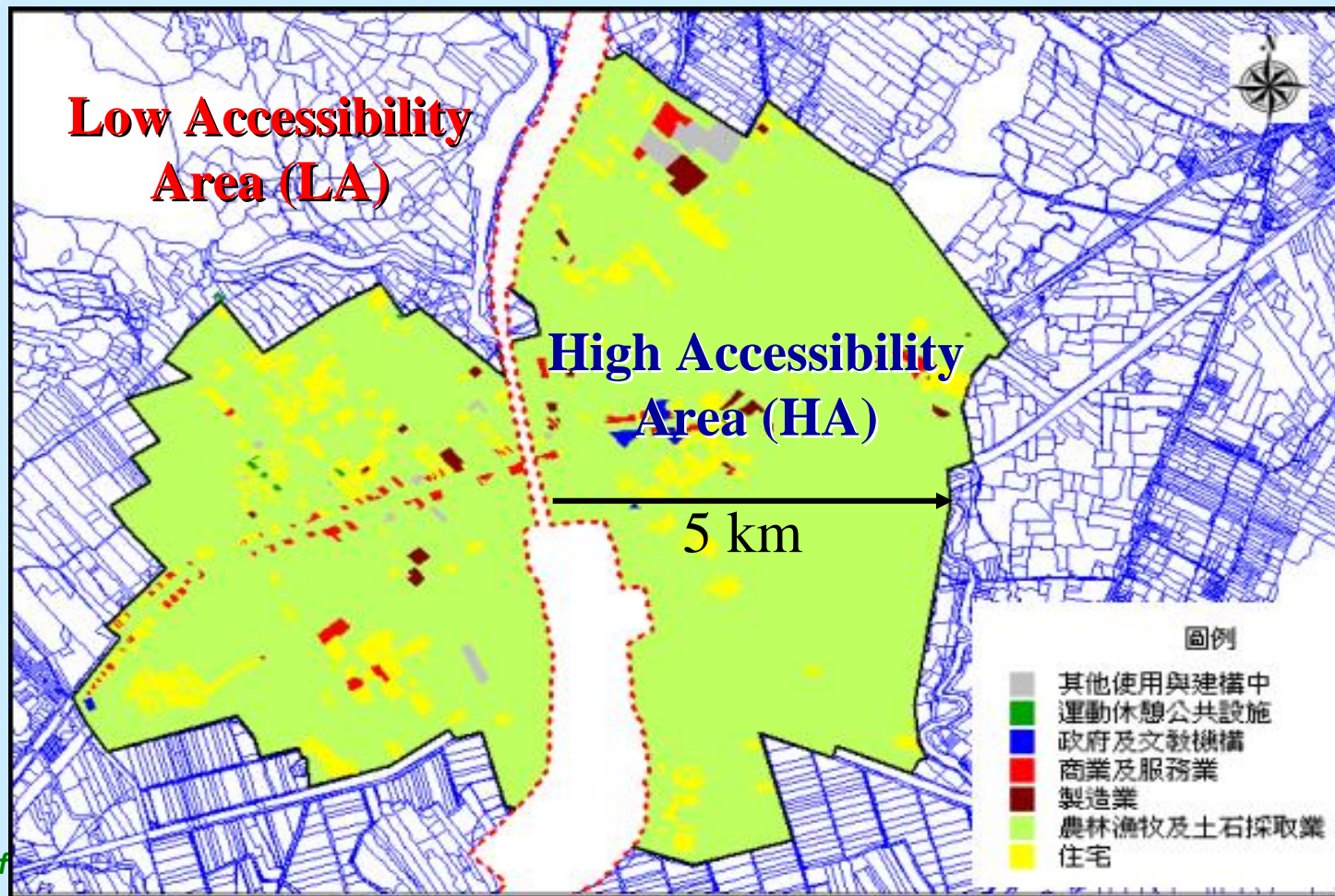
# Results (2/11)

- Whether freeway attracts immigration and industrial investment or accelerates the migration process



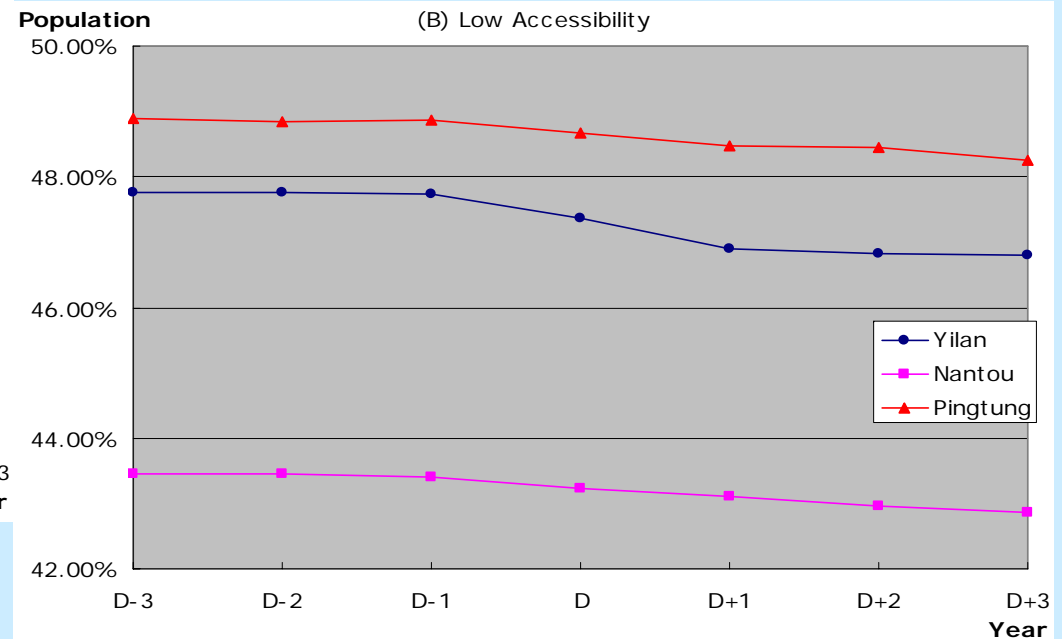
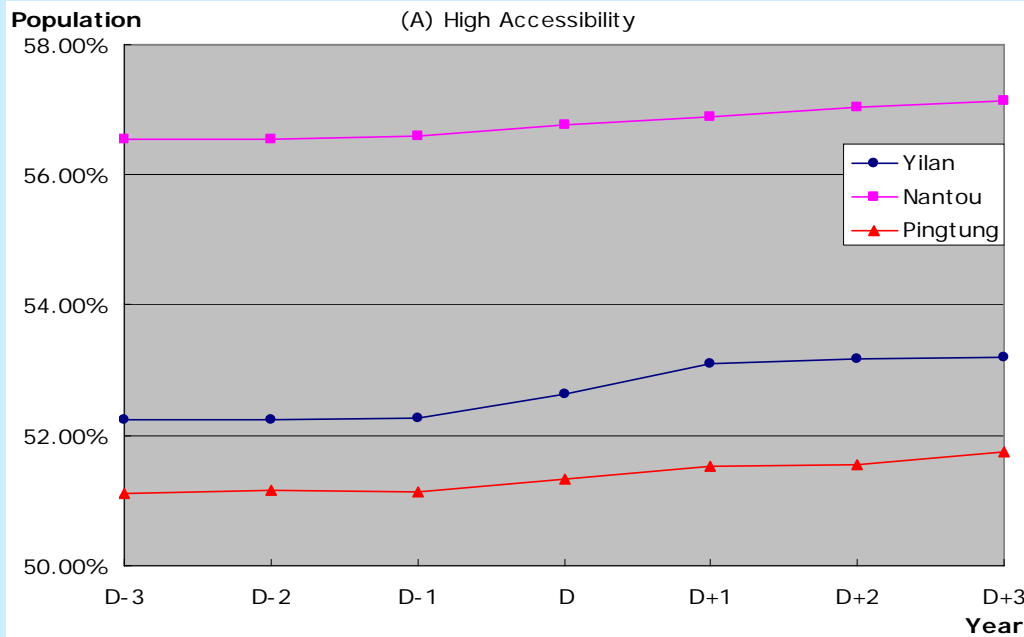
# Results (3/11)

## ➤ Low and High Accessibility Area



# Results (4/11)

## ➤ Impact on population distribution



**Note: The year D refers to 2002, 2003 and 2005, respectively, for the freeway interchanges in Nantou, Pintung and Yilan.**

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## ***Results (5/11)***

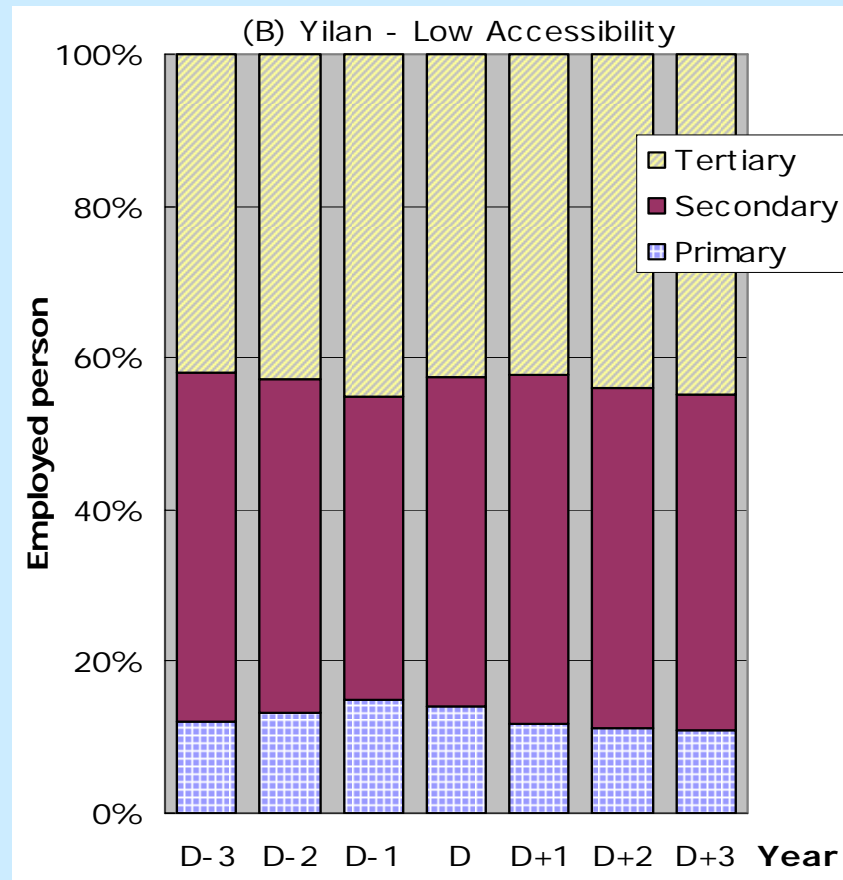
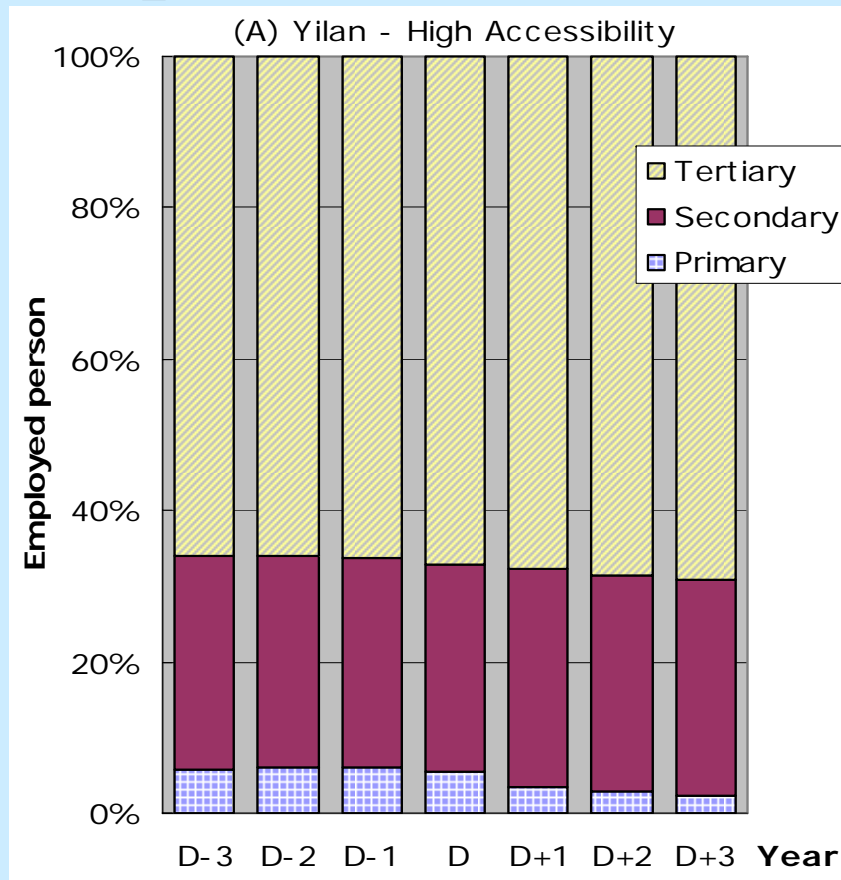
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### ➤ **Impact on population distribution**

- ❑ The freeway interchanges offering transport service in year D **positively impact** the residential population in **high accessibility areas**.
- ❑ In comparison, the proportion of the residential population **decreases gradually** in **low accessibility areas**.
- ❑ Freeway is thus **not** the major cause of **outward migration** in peri-urban areas.

# Results (6/11)

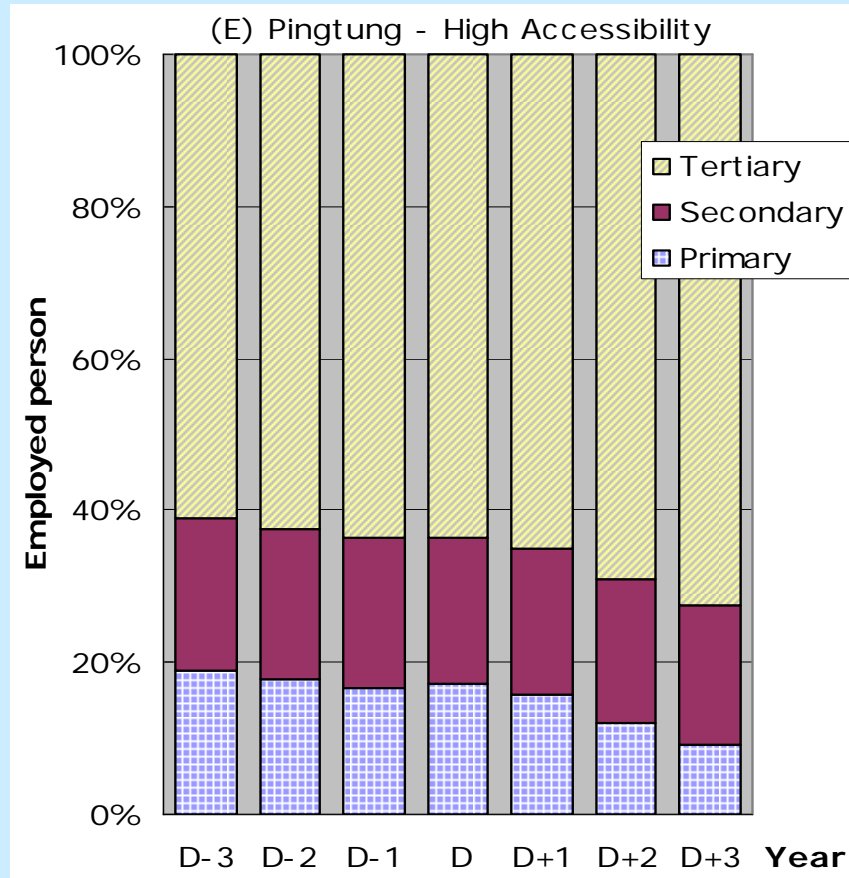
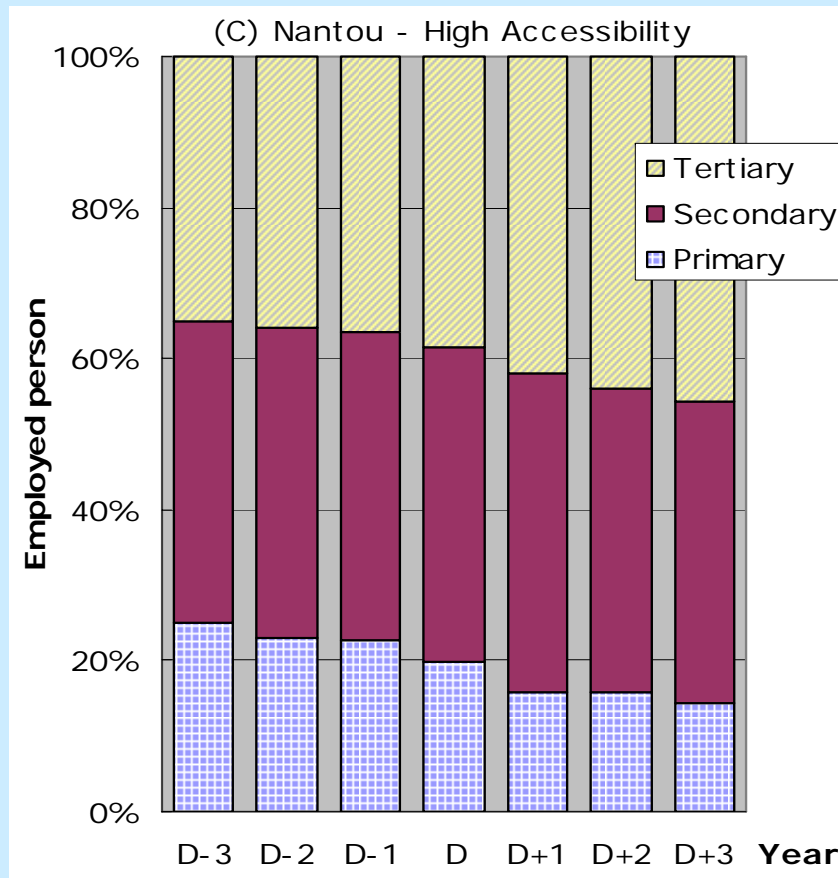
## ➤ Impact on industrial structure (Yilan)



*Note: The year D refers to 2005 for the freeway interchanges in Yilan.*

# Results (7/11)

## ➤ Impact on industrial structure (HA)



*Note: The year D refers to 2002 and 2003, respectively, for the freeway in Nantou and Pingtung.*





## ***Results (8/11)***

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### ➤ **Impact on industrial structure**

- ❑ Secondary industry - consistent percentage
- ❑ the percentage of the employment of primary industry decreases considerably, while that of the tertiary industrial increases markedly.
- ❑ Only a **small impact** on the employment structures in low accessibility areas.

# Results (9/11)

## ➤ Impact on land use pattern

### ☐ Changes of land use in Yilan

Year	Resident		Agriculture		Industry		Commerce		Others	
	HA	LA	HA	LA	HA	LA	HA	LA	HA	LA
2002	1132	2363	17095	120878	439	1130	95	75	3897	19109
2003	1130	2364	17093	120893	439	1130	95	74	3899	19096
2004	1130	2364	17092	121023	449	1133	95	74	3896	18981
2005 (D)	1020	2567	16912	121452	460	1060	97	73	3849	18579
2006	1014	2573	16867	124640	460	1038	97	72	4115	21102
2007	1013	2574	16856	124631	465	1016	98	72	4130	21112
2008	1011	2575	16855	124632	465	1013	99	72	4128	21110

Unit: ha

Note: HA represents high accessibility area, while LA represents low accessibility area.

Before D

Since D

☐ The trends of land use changes in Nantou and Pingtung are similar to Yilan for all patterns.



# *Results (10/11)*

## ➤ Impact on land use pattern (Nantou & Pingtung)

Unit: ha

Year	Resident		Agriculture		Industry		Commerce		Others	
	HA	LA	HA	LA	HA	LA	HA	LA	HA	LA
1999	1558	2605	38625	83869	418	1405	83	91	10028	1798
2000	1533	2632	37442	85101	419	1421	83	91	11250	2149
2001	1471	2698	37964	89138	419	1473	83	91	14851	3408
2002 (D)	1201	2941	36064	169977	537	1388	84	90	12121	4391
2003	1200	2954	33897	170409	578	1387	85	90	12286	4499
2004	1220	2990	33786	170995	594	1148	85	90	12378	4553
2005	1132	3044	32869	191957	596	1136	86	88	16426	8006

Unit: ha

Year	Resident		Agriculture		Industry		Commerce		Others	
	HA	LA	HA	LA	HA	LA	HA	LA	HA	LA
2000	2170	4912	39023	94960	1906	5339	73	152	7405	1704
2001	2051	4992	38399	99938	1920	6137	73	152	10100	2616
2002	2051	4992	38391	100006	1920	6138	73	152	10106	2617
2003 (D)	1958	5173	37543	118415	1934	5902	75	150	9393	2711
2004	1953	5140	36695	119398	2216	5691	75	147	9278	2681
2005	1942	5241	36589	119708	2264	5630	75	147	9364	2725
2006	1940	5247	36582	119865	2265	5565	76	147	9358	2723



## ***Results (11/11)***

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### ➤ **Impact on land use pattern**

- ❑ The variations of all land use patterns are **unremarkable** prior to the interchanges become operational in both high and low accessibility areas.
- ❑ Significant changes have resulted from the land readjustment in zoning plan which may be produced considering the introduction of freeway interchanges.



## *Conclusions (1/2)*

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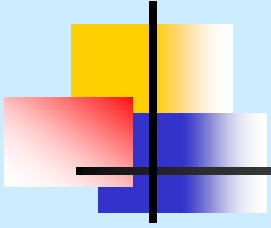
- The relationship between **land use development** and **accessibility to freeway** confirms the **bid-rent theory** in peri-urban areas.
- The spatio-temporal allocation of public facilities should be adjusted according to the **redistribution of population**.
- Policies encouraging **tourism related industries** should be developed to stimulate the local economy because freeway interchanges make the **tertiary industries** more attractive in high accessibility areas.



## *Conclusions (2/2)*

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- A **trade-off** consideration, in low accessibility areas, between **reserving agricultural industries** and **transforming into tertiary industries** should be determined.



***Thank You Very Much!***

