

# Mid- to Long-term Forecasts of Construction Market

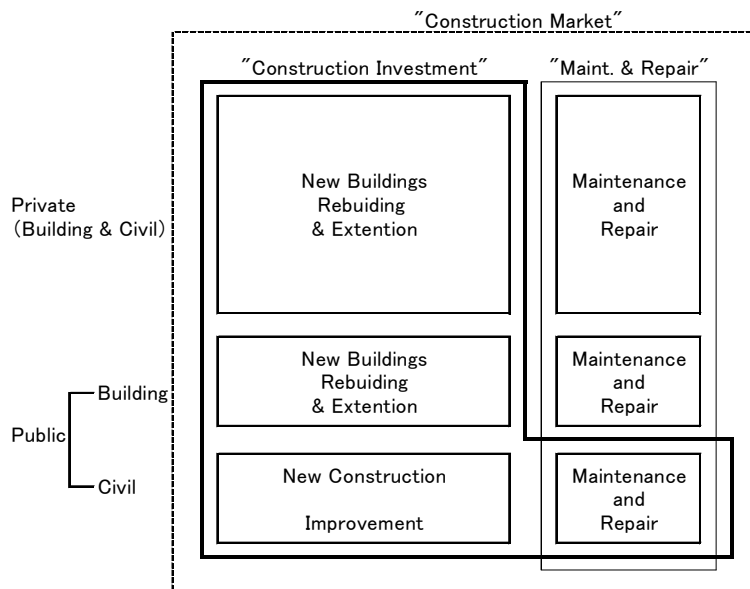
## - Prospects in 2010 and 2020 -

May 24, 2001

Research Institute of Construction and Economy

### 1 . Scope

- This study covers the following areas of the construction market, construction investment, and maintenance and repair.
- Numbers are based on constant prices in 1995.



### 2 . Premises

- We studied three scenarios assuming different real economic growth rates.
 

Case 1	FY2001-2010: 2.0%; FY2011-2020: 2.5%
Case 2	FY2001-2010: 2.0%; FY2011-2020: 1.5%
Case 3 (for reference)	FY2001-2010: 1.0%

### 3 . Forecast Results

(Unit: Trillion yen)

	FY2000	Case 1		Case 2		Case 3 (for ref.)			
		FY2001-2010		FY2011-2020		FY2001-2010		FY2001-2010	
		GDP Growth: 2.0%		GDP Growth: 2.5%		GDP Growth: 2.0%		GDP Growth: 1.5%	
		FY2010	FY2020	FY2010	FY2020	FY2010	FY2020		
<b>Construction Investment</b>	<b>71.6</b>	<b>58.0 - 63.1</b>	<b>57.7 - 62.8</b>	<b>58.0 - 63.1</b>	<b>52.1 - 57.2</b>	<b>53.6 - 58.7</b>			
※Based on original budget - See Footnote #2	67.2								
Public	31.7	22.7 - 27.8	22.7 - 27.8	22.7 - 27.8	22.7 - 27.8	22.7 - 27.8			
※Based on original budget - See Footnote #2	27.3								
Private	39.9	35.3	35.0	35.3	29.4	30.9			
Housing	20.8	16.9	12.9	16.9	12.6	16.5			
Non-Housing (Building)	9.9	11.5	14.7	11.5	10.2	8.6			
Non-Housing (Civil)	9.3	6.9	7.4	6.9	6.6	5.8			
<b>Maintenance and Repair</b>	<b>21.1</b>	<b>25.2 - 25.5</b>	<b>28.9 - 29.6</b>	<b>25.2 - 25.5</b>	<b>28.2 - 29.0</b>	<b>24.5 - 24.9</b>			
Public	6.0	7.0 - 7.3	7.2 - 7.9	7.0 - 7.3	7.2 - 7.9	7.0 - 7.3			
Civil	5.0	6.1 - 6.3	6.2 - 6.7	6.1 - 6.3	6.2 - 6.7	6.1 - 6.3			
Housing	0.2	0.3	0.3	0.3	0.3	0.3			
Non-Housing	0.7	0.7 - 0.8	0.7 - 0.9	0.7 - 0.8	0.7 - 0.9	0.7 - 0.8			
Private	15.1	18.2	21.7	18.2	21.0	17.5			
Housing	6.1	7.3	7.9	7.3	7.9	7.3			
Non-Housing (Building)	6.1	8.1	10.0	8.1	9.7	7.9			
Non-Housing (Civil)	2.9	2.8	3.8	2.8	3.4	2.3			
<b>Construction Market</b>	<b>87.7</b>	<b>77.1 - 82.4</b>	<b>80.4 - 85.7</b>	<b>77.1 - 82.4</b>	<b>74.2 - 79.4</b>	<b>72.0 - 77.3</b>			
	<b>FY2000</b>	<b>FY2010</b>	<b>FY2020</b>	<b>FY2010</b>	<b>FY2020</b>	<b>FY2010</b>			

Note 1. All numbers are based on constant prices in 1995

2. Construction investment in FY2000 is picked up from "Estimate of Construction Investment in FY2001" issued by the Ministry of Land, Infrastructure and Transport in April 2001. Although the statistics include additional public investment due to supplementary budget in public construction investment, our estimation is based solely on original budget excluding supplementary budget. Therefore, numbers based solely on original budget used in our forecast are also shown here for reference.

3. All numbers including FY2000 in maintenance and repair are derived from the estimation by the Research Institute of Construction and Economy.

4. In the "Construction Investment" field, "Public Construction Investment" normally includes "maintenance and repair in civil engineering" and the numbers used in the study are not exceptions. It is important to note that "Maintenance and Repair" also includes "maintenance and repair in public civil engineering." Therefore, "Construction Market" was derived by subtracting "maintenance and repair in public civil engineering" from the sum of "Construction Investment" and "Maintenance and Repair" to avoid double counting of maintenance and repair.

5. The numbers may not add up because of rounding the numbers to the nearest 100 million.

## **4 . Major Findings**

### **(1) Construction Market**

- The construction market as a whole will continue to shrink, though growth in maintenance and repair will somewhat offset the reduction in construction investment.
- The market size will shrink from 88 trillion yen in FY2000 to 77-82 trillion yen in FY2010 under Cases 1 and 2, and to 72-77 trillion yen under Case 3.

### **(2) Construction Investment**

- Construction investment as a whole will decrease as investment in each sub-sector is scaled down.
- The market size will shrink from 72 trillion yen in FY2000 to 58-63 trillion yen in FY2010 under Cases 1 and 2, and to 54-59 trillion yen under Case 3. The number in FY2000 was originally 67 trillion without additional public investment due to supplementary budgets.

#### **1) Public Investment**

- Public investment is estimated based on expected financial conditions in the future. Its role in boosting social infrastructure development and supporting economic growth is also considered.
- Growth rates are assumed to be:
  - Case A: FY2001-2010: 0%/yr; FY2011-2020: 0%/yr (Base Case)
  - Case B: FY2001-2010: -2%/yr; FY2011-2020: 0%/yr
- Estimation is based on public investment in the original budget averaged over FY1998-2000 excluding additional investment due to supplementary budgets.

#### **2) Private Housing Investment**

- Private housing investment is estimated considering fluctuations in number of households, growing number of unoccupied houses, and rebuilding demands.
- Numbers of housing starts are 1,030 thousand and 760 thousand in FY2010 and FY2020, respectively, while it was 1,210 thousand in FY2000.
- The decrease in investment is slower than that in the number of housing starts due to the increase in floor space per house and improving house quality.

#### **3) Private Non-housing Investment (Building and Civil Works)**

- Building investment is estimated from work-commenced floor space for major purposes including offices, stores, factories, warehouses, lodging facilities, private schools, and hospitals.
- Investment will generally trend downward, but will rise again in Case 1 with the economy

continually expanding at 2% or higher.

### **(3) Maintenance and Repair**

- The size of the maintenance and repair market is estimated based on the correlation between stock and demand. Past trends and future prospects in maintenance and repair works are both considered.
- It will expand due to growing stock.
- The market size will grow from 21 trillion yen in FY2000 to 25-26 trillion yen in FY2010 under Cases 1 and 2, and to 25 trillion yen under Case 3.

## 5. Concepts and Results of Forecast by Area

### Public construction investment

#### (1) Overall Concepts

The magnitude of public construction investment must be determined based on both the current financial position of the government and the importance of public investment. Continuous cutbacks in public investment just because the national finances need to be rebuilt may reduce public welfare in terms of upgrading the social infrastructure, and may further aggravate the national finances by impeding sustainable development of the national economy. In other words, investment that can truly upgrade public welfare and elevate productivity must be maintained at an appropriate level in future economic and financial policies, although such investment must be more focused than before.

However, the national finances will become increasingly precarious. In our prediction, therefore, expanding rates of public construction investment were reviewed in the study assuming that the growth rate of public construction investment would not exceed current levels, though the total amount of public construction investment will be decided based on the policy in each period.

#### (2) Concepts of Forecast

##### 1) Framework of base public construction investment

After the collapse of the bubble economy, the Japanese economy as a whole has been mired in a prolonged slump, though there were brief periods of recovery. A wide range of economic measures including additional public spending has been implemented to jump-start the economy.

As a result, a supplementary budget has been compiled each year and nominal public construction investment totaled 31.2 trillion yen in FY2000. It should be noted that the necessity and magnitude of the supplementary budget and public spending reserves should be assessed based on the financial policy in each period.

We therefore adopted investment in the original budget as the basis for predicting the future growth of public construction investment. Specifically, we broke down public construction investment in the past three years from FY1998-2000 into those in the original and supplementary budgets to predict effective public investment after FY2001 in constant prices of FY1995 based on the original budget.

The average over the original budgets of public construction investment in FY1998-2000 was adjusted by a deflator to be 27.8 trillion yen, the basis of our prediction.

**Figure 5-1. Estimates of Public Construction Investment Based on Original Budget**

(Trillion yen)

	1998	1999	2000	1998-2000 Average
Investment (nominal, including supplementary budget)	33.4	31.8	31.2	32.1
Investment (nominal, addition by supp. budget and reserves)	4.2	5.7	4.3	4.7
Investment (nominal, in original budget)	29.2	26.1	26.9	27.4
Deflator in FY1995 (calendar year)=100	99.0	98.0	98.3	-
Effective investment (constant prices of FY1995, in original budget)	29.5	26.7	27.3	27.8

**Notes**

1. Construction investment in FY2000 is taken from "Estimate of Construction Investment in FY2001" issued by the Ministry of Land, Infrastructure and Transport in April 2001.
2. Supplementary budget and public spending reserves are estimates of the Research Institute of Construction and Economy.
3. An overall construction work deflator was employed.
4. Investment (effective number in constant prices of FY1995 based on original budget) includes carry-over of original budget from the previous fiscal year.

**2) Premises on investment growth**

In our prediction of the future expansion of public construction investment, therefore, the ratio of the investment in the national budget is assumed not to exceed current levels because of the weak financial position of Japan. The Base Case employs zero increase in the ratio to attain the expected level of social infrastructure development, but in the other case, a slight cutback in construction investment is considered. The economic and financial environment and level of social infrastructure development during FY2011-2020 are assumed to maintain previous levels, because they are difficult to predict accurately.

Case A: FY2001-2010: 0%/yr; FY2011-2020: 0%/yr (Base Case)

In this case, no decrease in ratio is assumed to attain the expected level of social infrastructure development.

Case B: FY2001-2010: -2%/yr; FY2011-2020: 0%/yr

This case represents the situation in which public construction investment may be slightly decreased due to the weak financial position of the Japanese government.

**(3) Forecasts**

The table below shows our forecasts for the cases above. Public construction investment in FY2010 and 2020 are 27.8 and 22.7 trillion yen in Cases A and B, respectively.

**Figure 5-2. Public Construction Investment in FY2010 and 2020**

(Trillion yen)

	1998	1999	2000	Ave. 1998-2000	FY	2005	<b>2010</b>	2015	<b>2020</b>
Public construction investment	29.5	26.7	27.3	27.8	Case A	27.8	<b>27.8</b>	27.8	<b>27.8</b>
					Case B	25.2	<b>22.7</b>	22.7	<b>22.7</b>

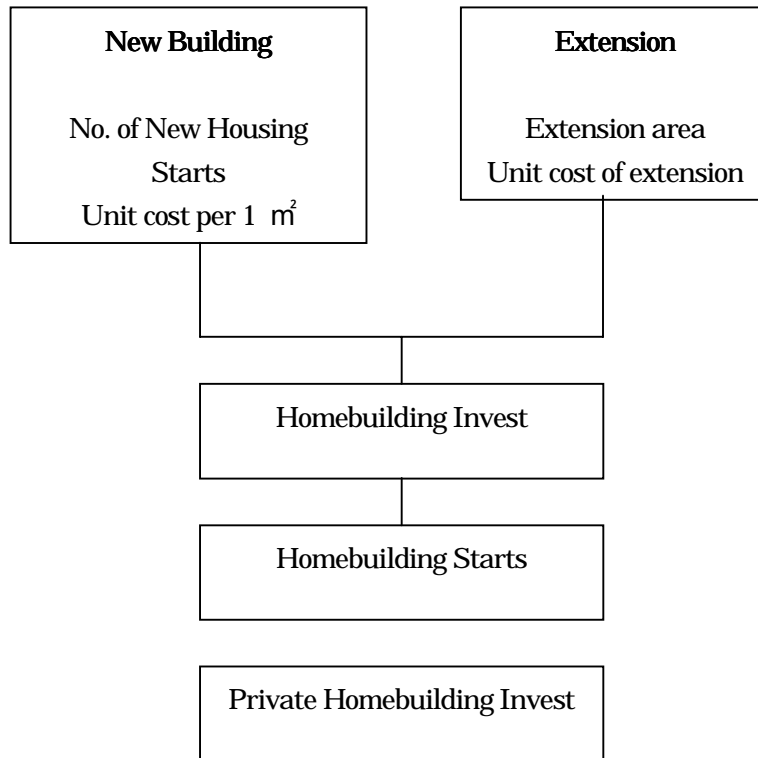
Note: Investment during FY1998-2000 is derived from the estimation by the Research Institute of Construction and Economy and the effective number in constant prices of FY1995 based on the original budget.

Additional investment may be made with supplementary budgets depending on the economic environment of each period. A nominal 4.7 trillion yen on average was additionally invested during FY1998-2000. (See Figure 5-1.)

# Private Homebuilding Investment

## (1) Concepts of Forecast

Figure 5-3. General Flowchart for Forecasting Private Homebuilding Investment



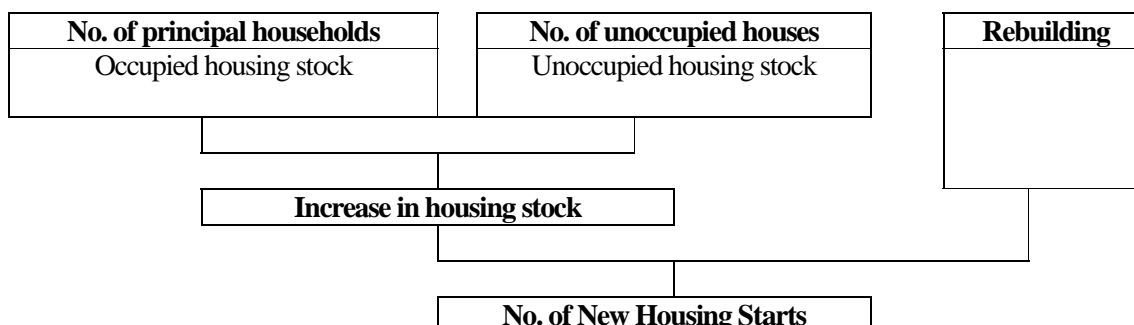
## (2) Estimation of New Homebuilding Costs

### 1) Forecast on the Number of New Housing Starts

The Number of New Housing Starts depends in the long term on trends in housing stock and demand for rebuilding. Trends in housing stock are in turn determined by the number of households and unoccupied houses (vacant houses in the broad sense). Demand for rebuilding is driven mainly by the deterioration of houses.



**Figure 5-4. Flowchart for Forecasting the Number of New Housing Starts**



**i) Forecast on the Number of Households**

The increase in the number of households affects homebuilding more directly than other parameters, because the primary objective of housing is to provide personal living space, one of the most precious things for individuals. We look at "principal households" excluding lodgers to estimate the number of households, which generates increasing pressure on housing stock.

The forecast based on trends in principal household share in age-groups during 1990-1995 shows that the number of principal households will continue increasing and will peak around 2015, after which it will start decreasing resulting from the diminishing population. (See Figure 5-5.)

**Figure 5-5. Number of Principal Households**

Age Group	Records		Forecasts					(No. of households)
	1990	1995	2000	2005	2010	2015	2020	
Total	38,993,993	42,240,086	44,725,191	46,647,751	47,729,962	48,036,786	47,749,738	
-15	436	488	406	398	400	392	371	
15-19	420,347	447,676	352,207	308,099	281,549	284,938	290,917	
20-24	1,753,295	2,069,117	1,739,587	1,519,286	1,329,350	1,214,817	1,229,491	
25-29	2,194,318	2,492,655	2,950,010	2,479,978	2,166,421	1,895,582	1,732,556	
30-34	2,754,932	2,990,331	3,377,738	3,997,432	3,361,082	2,936,417	2,569,660	
35-39	3,692,651	3,168,539	3,420,342	3,864,262	4,573,572	3,845,815	3,360,570	
40-44	4,971,307	4,050,477	3,461,875	3,737,901	4,224,165	5,000,192	4,205,367	
45-49	4,605,889	5,289,393	4,291,235	3,669,447	3,963,302	4,480,331	5,304,138	
50-54	4,282,317	4,731,760	5,414,600	4,393,186	3,759,104	4,061,815	4,593,622	
55-59	4,183,137	4,322,026	4,751,015	5,441,404	4,415,150	3,779,623	4,086,738	
60-64	3,619,145	4,090,519	4,213,144	4,647,246	5,329,298	4,324,230	3,705,168	
65-69	2,556,857	3,438,259	3,891,308	4,026,428	4,435,909	5,096,387	4,134,548	
70-74	1,807,278	2,335,645	3,146,537	3,573,033	3,705,340	4,088,457	4,711,368	
75-79	1,284,787	1,509,534	1,980,261	2,672,399	3,047,031	3,169,075	3,504,375	
80-84	624,376	896,015	1,085,585	1,443,942	1,951,192	2,238,155	2,336,906	
85-	242,921	407,652	649,341	873,310	1,187,097	1,620,559	1,983,943	

Note: Estimation by RICE

## ii) Forecast on Unoccupied Housings

Housing stock in 1998 was 50.25 million, but 12.6% or 6.32 million were unoccupied. Unoccupied housings have continuously increased both in number and percentage relative to total housing stock since 1963, because Japan has sufficient a number of housings to satisfy demand. Unoccupied housings will further increase due to the increasing housing stock. However, the rate of increase will slow down because policies to liquidify and reduce unoccupied housings such as development of the secondhand housing market. (See Figure 5-6.)

**Figure 5-6. Number of Unoccupied Housings**

Year	Total	Temporary occupied	Unoccupied	Under construction	(No. of housings)
1993	5,105,500	428,600	4,475,800	201,000	Records
1998	6,323,900	393,600	5,764,100	166,200	
2000	6,457,557	411,100	5,880,299	166,158	Forecasts
2005	6,811,859	411,100	6,244,516	156,244	
2010	7,109,499	411,100	6,568,961	129,438	
2015	7,401,364	411,100	6,884,878	105,386	
2020	7,690,297	411,100	7,194,006	85,190	

## iii) Forecast on Rebuildings

Japan's population will peak and start decreasing in the near future, putting downward pressure on housing demand as the housing stock increases. While the housing standard is improving, the number of old housing stock is growing, which suggests that rebuilding accounts for a fairly high percentage of homebuilding starts. However, there is no index on the number of rebuildings and percentage of rebuildings in homebuilding starts. We assumed the number of removed housings as rebuilt ones to have a high rebuilding ratio of over 40% in recent years. The number of removed housings is the difference between the number of housings built and the increase of housing stock in a specific period.

Trends in house removals by construction period and structure show that the percentage of rebuilding in homebuilding starts will decrease in the future. The main reason is that wooden as well as non-wooden houses are becoming durable and higher quality. The number of removals will be maintained due to the increasing housing stock. We calculated the number of removals or rebuilding housings by breaking down the housing stock by construction period using the trend and past records. (See Figure 5-7.)

**Figure 5-7. Removal Rates and Numbers**

		Records		Forecast				
		1993	1998	2000	2005	2010	2015	2020
Housing Stock		40,773,300	43,922,100	44,725,191	46,647,751	47,729,962	48,036,786	47,749,738
(Occupied)								
Removed		3,369,000	3,632,901	1,549,039	3,685,356	3,773,803	3,799,305	3,788,545
Removal Rate (Against stock in the prev. period)		9.14%	8.91%	3.53%	8.24%	8.09%	7.96%	7.89%

**iv) Forecast on Homebuilding Starts**

The forecast on new homebuilding starts based on the above i) to iii) is shown in Figure 5-8.

**Figure 5-8. New Homebuilding Starts**

			Incremental no. of households	Incremental no. of unoccupied houses	Rebuilding	Starts	
						5 year total	Annual
2000	~	2005	1,922,560	354,302	3,685,356	5,962,218	1,192,444
2005	~	2010	1,082,211	297,640	3,773,803	5,153,654	1,030,731
2010	~	2015	306,824	291,865	3,799,305	4,397,994	879,599
2015	~	2020	-287,049	288,932	3,788,545	3,790,429	758,086

Figure 5-8 shows that the number of new homebuilding starts will decrease compared to 1999. While the number in 1999 was 123,000, annual starts in 2000-2005, 2005-2010, 2010-2015, and 2015-2020 are around 119,000, 103,000, 88,000, and 76,000, respectively.

**2) Construction Cost of a New Building**

We estimated the floor area per house (Figure 5-9) and unit cost per 1 m<sup>2</sup>, which depend on the economic growth rate. Multiplying the numbers by the number of homebuilding starts produces the construction cost of a new building as shown in Figure 5-10.

$$\boxed{\# \text{ of new homebuilding starts}} \times \boxed{\text{floor area per house}} \times \boxed{\text{unit cost per 1 m}^2} = \boxed{\text{cost of new buildings}}$$

**Figure 5-9. Floor Area per Newly Built House**

( m<sup>2</sup> )

	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015	2016-2020
Ownership	137.6	139.6	140.0	141.3	142.8	144.3
Subdivided stand-alone and terrace	102.3	103.2	103.2	103.2	103.2	103.2
Condominium	80.1	86.7	88.1	89.9	91.2	92.4
Rent	50.5	52.4	53.8	56.1	58.6	61.2
Tied house	69.9	72.0	72.0	72.0	72.0	72.0

**Figure 5-10. Construction Cost of a New Building by GDP Case**

Case 1

(Assumed GDP growth rates are: 2.0% in 2001-2010 and 2.5% in 2011-2020)

(Million yen)

			Ownership			Rent		Total const. Cost	
			Ownership	Subdivision		Rent	Tied house	(5 years)	(Annual)
				Stand-alone and terrace	Condominium				
2000	~	2005	49,445,592	7,882,720	12,003,522	17,227,069	808,419	87,367,323	17,473,465
2005	~	2010	43,218,399	6,848,262	11,144,881	16,014,801	720,191	77,946,535	15,589,307
2010	~	2015	37,342,933	5,875,334	10,100,113	14,882,934	641,189	68,842,503	13,768,501
2015	~	2020	32,328,181	5,045,922	9,088,896	14,137,202	583,319	61,183,520	12,236,704

Case 2

(Assumed GDP growth rates are: 2.0% in 2001-2010 and 1.5% in 2011-2020)

(Million yen)

			Ownership			Rent		Total const. Cost	
			Ownership	Subdivision		Rent	Tied house	(5 years)	(Annual)
				Stand-alone and terrace	Condominium				
2000	~	2005	49,445,592	7,882,720	12,003,522	17,227,069	808,419	87,367,323	17,473,465
2005	~	2010	43,218,399	6,848,262	11,144,881	16,014,801	720,191	77,946,535	15,589,307
2010	~	2015	36,973,098	5,817,146	10,000,084	14,735,538	634,839	68,160,705	13,632,141
2015	~	2020	31,703,313	4,948,390	8,913,218	13,863,945	572,044	60,000,910	12,000,182

Case 3

(Assumed GDP growth rates are: 1.0% in 2001-2010)

(Million yen)

			Ownership			Rent		Total const. Cost	
			Ownership	Subdivision		Rent	Tied house	(5 years)	(Annual)
				Stand-alone and terrace	Condominium				
2000	~	2005	48,932,563	7,800,932	11,878,978	17,048,327	800,031	86,460,832	17,292,166
2005	~	2010	42,339,778	6,709,039	10,918,308	15,689,223	705,550	76,361,898	15,272,380

### (3) Estimation of Private Housing Investment

The total cost of homebuilding starts is calculated by adding the estimated construction cost of new buildings and rebuildings to estimate total investment (see Figure 5-11). The figure shows that private housing investment under Case 1 will be 16.9 and 12.9 trillion yen in FY2006-2010 and 2016-2020, respectively, dropping by 24 and 42% compared to annual investment during FY1996-2000. The reduction in investment, however, is smaller than that in the number of new homebuilding, 25 and 45% in FYFY2006-2010 and 2016-2020, respectively, against FY1996-2000, due to the future increase in floor area per house and unit cost of construction.

**Figure 5-11. Investment in Housing**

Case 1

(Assumed GDP growth rates are: 2.0% in 2001-2010 and 2.5% in 2011-2020)

(100 million yen)

Fiscal year		Cost of New build.	Cost of Rebuild.	Total Cost	Effective Inv. in housing		Pub.Inv. in housing (Annual)	Pri.Inv. in housing (Annual)	Records Forecasts
					(5 yrs)	(Annual)			
1976	- 1980	467,584	98,639	566,224	1,057,011	211,402	12,817	198,585	
1981	- 1985	493,472	99,975	593,447	936,955	187,391	10,499	176,892	
1986	- 1990	831,640	107,299	938,939	1,270,979	254,196	9,925	244,271	
1991	- 1995	1,018,934	129,719	1,148,652	1,282,073	256,415	14,585	241,830	
1996	- 2000	965,460	115,088	1,080,549	1,182,619	236,524	13,257	223,267	
2001	- 2005	873,673	94,887	968,560	1,018,572	203,714	12,352	191,362	
2006	- 2010	779,465	80,365	859,831	904,228	180,846	12,174	168,671	
2011	- 2015	688,425	67,591	756,016	795,053	159,011	12,056	146,954	
2016	- 2020	611,835	56,568	668,403	702,917	140,583	11,997	128,587	

Case 2

(Assumed GDP growth rates are: 2.0% in 2001-2010 and 1.5% in 2011-2020)

(100 million yen)

Fiscal year		Cost of New build.	Cost of Rebuild.	Total Cost	Effective Inv. in housing		Pub.Inv. in housing (Annual)	Pri.Inv. in housing (Annual)
					(5 yrs)	(Annual)		
1976	- 1980	467,584	98,639	566,224	1,057,011	211,402	12,817	198,585

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2001 - 2005	873,673	94,887	968,560	1,018,572	203,714	12,352	191,362
2006 - 2010	779,465	80,365	859,831	904,228	180,846	12,174	168,671
2011 - 2015	681,607	66,922	748,529	787,179	157,436	12,056	145,379
2016 - 2020	600,009	55,475	655,484	689,330	137,866	11,997	125,869

Forecasts

### Case 3

(Assumed GDP growth rates are: 1.0% in 2001-2010)

(100 million yen)

Fiscal year	Cost of New build.	Cost of Rebuild.	Total Cost	Effective Inv. in housing		Pub.Inv. in housing (Annual)	Pri.Inv. in housing (Annual)
				(5 yrs)	(Annual)		
1976 - 1980	467,584	98,639	566,224	1,057,011	211,402	12,817	198,585
1981 - 1985	493,472	99,975	593,447	936,955	187,391	10,499	176,892
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1991 - 1995	1,018,934	129,719	1,148,652	1,282,073	256,415	14,585	241,830
1996 - 2000	965,460	115,088	1,080,549	1,182,619	236,524	13,257	223,267
2001 - 2005	864,608	93,902	958,511	1,008,004	201,601	12,352	189,248
2006 - 2010	763,619	78,731	842,350	885,845	177,169	12,174	164,995

Records

Forecasts

Note: Investments are in effective price based on 1995

## Private Non-Housing Construction Investment

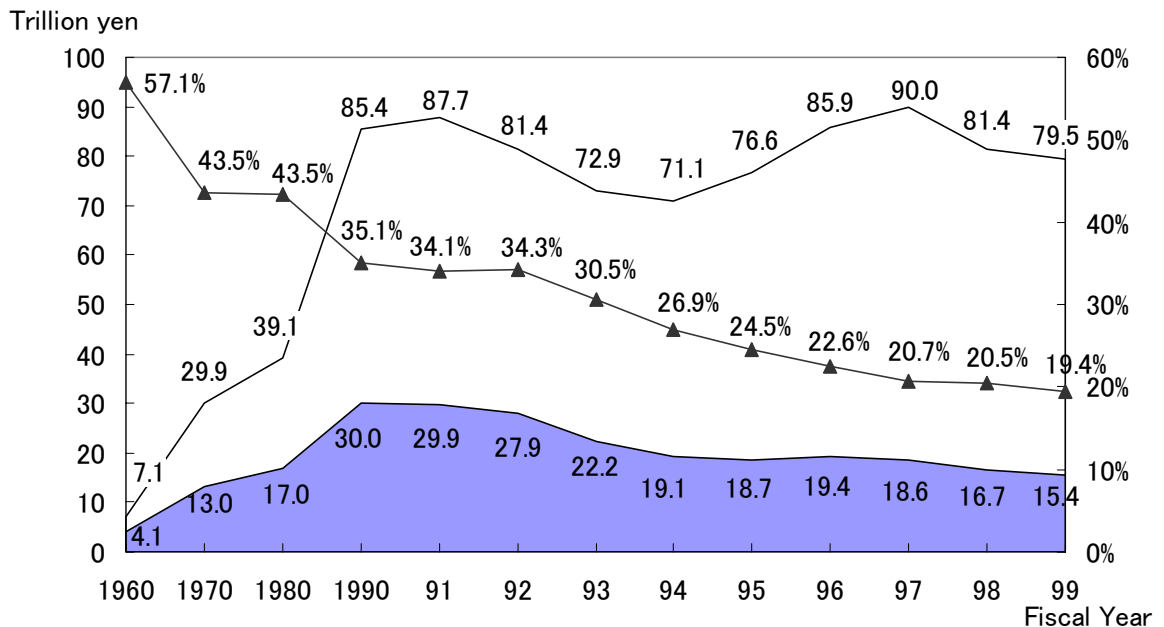
### (1) Overall Trends and Future Prospects

Private investment in non-housing construction is a part of and affected by private capital expenditure.

Ordinary profit of corporations is a leading indicator of private capital expenditure. Growing profit will lead to increased investment in the next and later fiscal years.

Another point is the ratio of private investment in non-housing construction to private capital expenditure. The share of construction investment in capital expenditure continues to decrease, from 57.1% in 1960 to 35.1% in 1990 and further to 19.5% in 1999. This is because machines and equipment now require more investment than encapsulating buildings as industry has become more advanced (see Figure 5-12).

**Figure 5-12. Private Investment in Non-Housing Construction Against Private Capital Expenditure**



	Effective private capital expenditure (A)
	Effective private investment in non-residential construction (B)
	Construction investment/Capital expenditure (B/A)

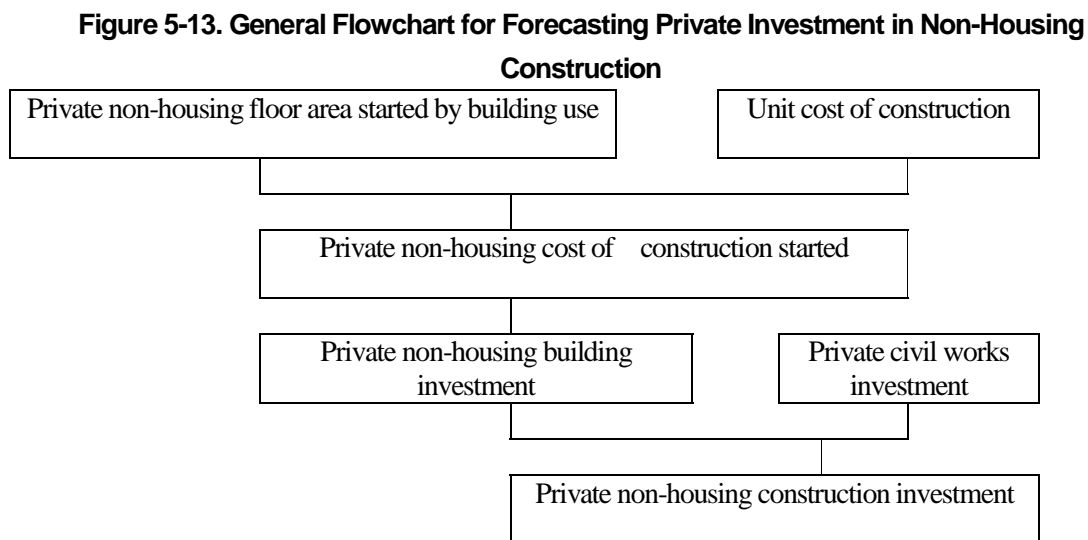
Note: Compiled from in-house materials of the Prime Minister's Office and the Ministry of Land, Infrastructure and Transport

Private investment in non-housing construction will continue to reflect the trends of the economy and corporate earnings. The ratio will also continue decreasing, because investment in information technologies such as computers is rapidly increasing while spendable capital remains limited.

In other words, expanding private investment in non-housing construction in the long term requires the economy to grow at a certain level, resulting in firm growth of capital spending.

## (2) Concepts of Forecast

### 1) Flowchart for Forecasting Private Investment in Non-Housing Construction



### 2) Brief Description of Method of Forecasting Private Non-Housing Building Investment

We estimated the floor area per house (Figure 5-9) and unit cost per 1 m<sup>2</sup>, which depend on the economic growth rate. Multiplying the numbers by the number of homebuilding starts produces the building cost of a new building as shown in Figure 5-10.

We first estimated the floor area of construction started by building uses, and then multiplied it by the unit cost per floor area to obtain the construction cost started. Private non-housing construction investment can be derived by translating the construction cost started into investment concepts (see below).



$\text{Investment} = f(\text{Construction cost at starts})$ $\text{Construction cost at starts} = \text{Construction area started} \times \text{Unit cost}$
---

The floor area of construction started by building uses can be divided into the following two categories.

- 1) Floor area of demand for new buildings (corresponds to increment in stock floor area)
- 2) Floor area of demand for renewal or rebuilding (corresponds to floor area removed)

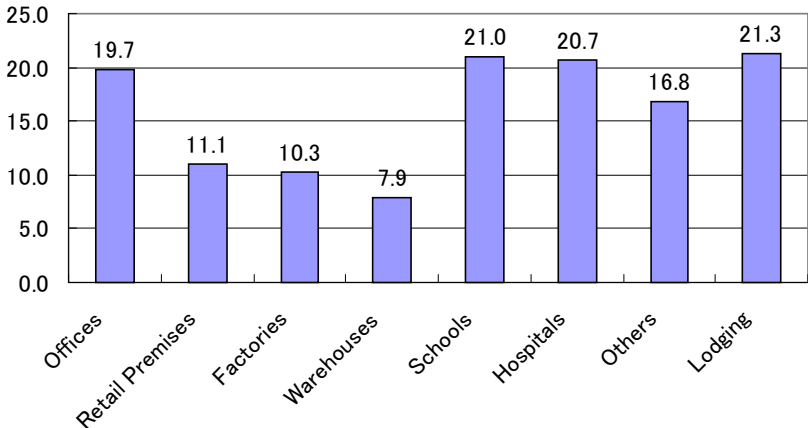
$\begin{aligned} & \text{Stock floor area at } x \text{ year-end} - \text{Stock floor area at } x-1 \text{ year-end} \\ & + \text{Floor area started in } x \text{ year} - \text{Floor area removed in } x \text{ year} \\ & \text{Floor area started in } x \text{ year} \\ & \text{Stock floor area at } x \text{ year-end} - \text{Stock floor area at } x-1 \text{ year-end} \\ & + \text{Floor area removed in } x \text{ year} \end{aligned}$
<div style="display: flex; justify-content: space-around;"> <span>1) Demand for New Buildings</span> <span>2) Demand for Renewal or Rebuilding</span> </div>

We first predicted the stock floor area for each usage of buildings and added the floor area removed to estimate the future floor area started based on the above assumptions.

**3) Forecasts on Costs of Building Started**

Costs of building started were derived by multiplying the estimated floor area started by the unit cost of construction in FY1999.

**Figure 5-14. Unit Cost of Building by Building Use (Nominal Numbers in FY1999)**



**Figure 5-15. Costs of Building Started**

**i) Case 1**

(Annual average)

→Forecasts

(100 million yen)

	89-93	94-97	98-2000	01-05	06-10	11-15	16-20
Offices	45,398	17,991	13,935	17,926	16,147	15,356	17,814
Retail Premises	28,180	19,829	18,961	16,458	17,033	21,240	22,501
Factories	30,274	17,440	12,533	15,226	16,928	20,031	27,311
Warehouses	16,845	9,806	6,176	7,674	8,686	9,419	9,780
Lodging	14,290	6,378	3,527	6,162	6,770	7,311	7,317
Schools	4,608	3,930	3,872	1,777	2,075	2,739	2,411
Hospitals	5,049	6,652	8,333	5,284	5,629	5,943	5,914
Others	35,366	26,029	20,361	22,704	24,008	27,349	31,391
Total	180,009	108,054	87,698	93,211	97,276	109,388	124,439

**ii) Case 2**

(Annual average)

→Forecasts

(100 million yen)

	89-93	94-97	98-2000	01-05	06-10	11-15	16-20
Offices	45,398	17,991	13,935	17,926	16,147	12,449	14,903
Retail Premises	28,180	19,829	18,961	16,458	17,033	15,941	16,059
Factories	30,274	17,440	12,533	15,226	16,928	13,699	13,835
Warehouses	16,845	9,806	6,176	7,674	8,686	7,296	7,460
Lodging	14,290	6,378	3,527	6,162	6,770	6,247	5,939
Schools	4,608	3,930	3,872	1,777	2,075	2,739	2,411
Hospitals	5,049	6,652	8,333	5,284	5,629	5,312	4,732
Others	35,366	26,029	20,361	22,704	24,008	20,756	21,217
Total	180,009	108,054	87,698	93,211	97,276	84,438	86,555

**iii) Case 3**

(Annual average)

→Forecasts

(100 million yen)

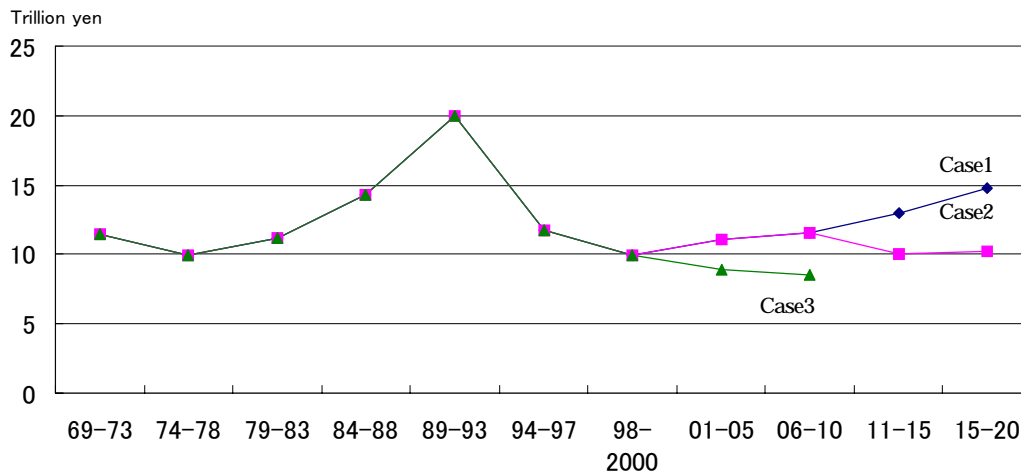
	89-93	94-97	98-2000	01-05	06-10
Offices	45,398	17,991	13,935	14,764	13,148
Retail Premises	28,180	19,829	18,961	12,232	13,730
Factories	30,274	17,440	12,533	12,520	8,826
Warehouses	16,845	9,806	6,176	5,797	6,724
Lodging	14,290	6,378	3,527	5,296	5,755
Schools	4,608	3,930	3,872	1,777	2,075
Hospitals	5,049	6,652	8,333	4,771	4,644
Others	35,366	26,029	20,361	18,111	17,452
Total	180,009	108,054	87,698	75,268	72,353

**4) Forecasts on Private Non-Housing Building Investment**

The figure below shows our forecast on private non-housing building investment.

**Figure 5-16. Effective Private Non-Housing Building Investment**

	1970	1975	1980	1985	1990	1995	2000	→Forecasts (Trillion yen)			
								2005	2010	2015	2020
Case 1	11.4	9.9	11.2	14.3	20.0	11.7	9.9	11.0	11.5	12.9	14.7
Case 2								11.0	11.5	10.0	10.2
Case 3								8.9	8.6		



### (3) Forecasts on Private Civil Works Investment

Available statistics on the demand for private civil works are insufficient to estimate construction investment. Therefore, we conducted several interviews in major areas to determine the prospects of future investment and predicted civil works investment using past trends.

Private civil works investment tends to decrease relative to "private non-housing building investment" during times of economic expansion, and to increase during recessions. In other words, private civil works investment is stable independent of economic cycles, and accounts for a certain share of construction investment.

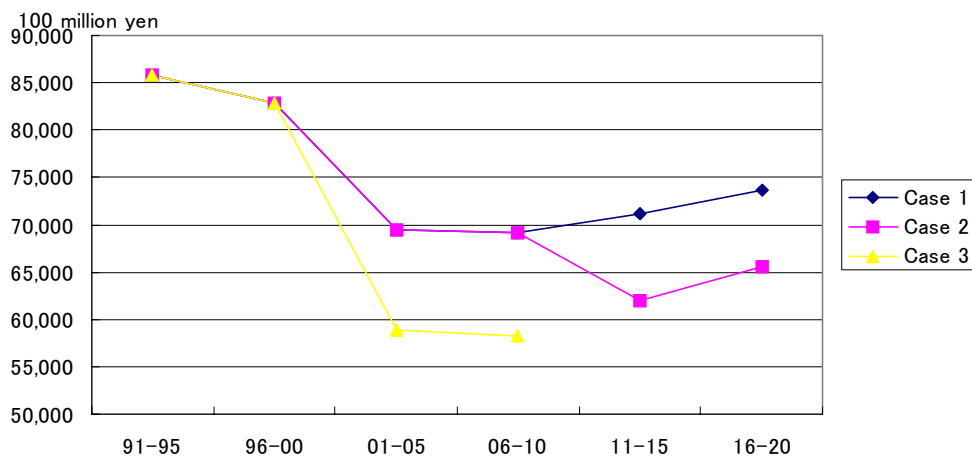
Our interviews revealed that large-scale capital expenditures were unlikely to push up private civil works investment in the future.

We estimated the ratios of private civil works investment and multiplied them by estimated private non-housing building investments to obtain a forecast on private civil works investments. The ratios would be low under strong GDP growth. Under Cases 1 and 2, GDP growth is assumed to approximately maintain the average growth rate during the 1990's until 2010. As a result, the ratio of private civil works to private non-housing building investments is predicted to be similar to those in

the 1990's, with estimated private civil works investment of 6.9 trillion yen in 2010. Under low growth Case 3, though the share would be higher, private civil works investment will decrease to 5.9 trillion yen in 2010. In 2020 under Case 1, the share slightly decreases because of higher GDP growth rate, but investment increases to 7.4 trillion yen. In Case 2 with a weakening economy, the share slightly increases, but investment decreases to 6.6 trillion yen.

**Figure 5-17. Annual Effective Private Civil Works Investment**

	Records		Forecasts			
	91-95	96-00	01-05	06-10	11-15	16-20
Case 1	85,851	82,765	69,519	69,097	71,224	73,659
Case 2	85,851	82,765	69,519	69,097	61,976	65,580
Case 3	85,851	82,765	58,810	58,246		



Note: Investment in FY1991-2000 is taken from "Estimate of Construction Investment in FY2001" issued by the Ministry of Land, Infrastructure and Transport in April 2001.

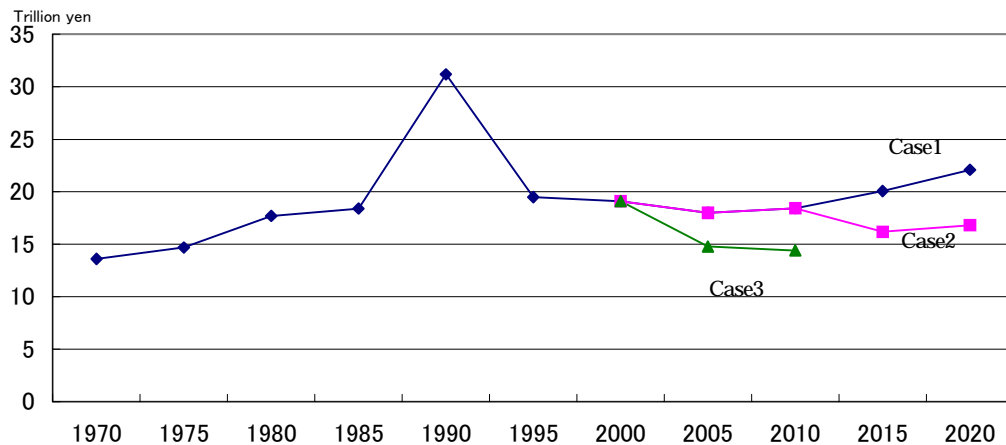
#### (4) Forecasts on Private Non-Housing Construction Investment

Figure 5-18 shows forecasts on overall private non-housing construction investment, which is the sum of private investments in non-housing construction and civil works.

**Figure 5-18. Effective Private Investment in Non-Housing Construction**

(Trillion yen)

									→Forecasts			
	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	
Case 1	13.6	14.7	17.7	18.4	31.2	19.5	19.1	18.0	18.4	20.1	22.1	
Case 2								18.0	18.4	16.2	16.8	
Case 3								14.8	14.4			



## Maintenance and Repair

### (1) Definitions

Construction investment refers to investments in new buildings, rebuilding, and extension areas of construction works. Construction works include maintenance and repair as well. The significance of the maintenance and repair market is growing in the whole construction market, while construction investment is shrinking. Therefore, we decided to look at the future of the market with the definition below.

Definition of maintenance and repair

- Works to slow functional deterioration

- Works to restore functions to the original level upon completion of construction

- Works to upgrade or add functions exceeding the level upon completion of construction

Examples:

- Ordinary repair works

- Exterior repainting, repair works on an air-conditioning system, etc.

- Barrier-free works, energy-saving works, earthquake-proof works, etc.

### (2) Overall Trends and Future Prospects

Construction works include maintenance and repair as well as those covered by construction investment. During the 1990's, the maintenance and repair market continuously expanded, while construction investment kept shrinking. In other words, the maintenance and repair market is becoming increasingly important.

The scale of maintenance and repair heavily depends on the amount of stock to which such works are applied. The stock of private building grew by around 20% from 1990 to 1999, while that of social infrastructure grew by around 60% from 1983 to 1993. The enormous amount of stock is aging and will push up investment in maintenance and repair. Many buildings completed after the 1980's, in particular, will need maintenance and repair in the near future and will thus expand the market, because maintenance and repair works including rebuilding and expansion generally peak at around 20 years after construction.

The maintenance and repair market continuously grew during the 1990's in terms of flow, thus gaining a larger share of the construction market, while construction investment is sluggish. Future trends will remain the same as before.

The share of maintenance and repair in the construction market in Europe is now significantly higher than that in Japan. Following Europe, the share in Japan will grow as its building stock matures.

### (3) Concepts of Forecast

We predicted the scale of the maintenance and repair market by first estimating future stock, because the maintenance and repair market has strong correlation with stock. A flow approach was employed for those areas in which stock was difficult to estimate.

### (4) Forecasts

The overall maintenance and repair market is estimated to be 21.1 trillion yen in FY2000. It will grow 25.2-25.5 trillion yen in FY2010 under an average GDP growth rate of 2.0%. It will further grow respectively to 28.9-29.6 and 28.2-29.0 trillion yen in FY2020 under Cases 1 and 2 with average GDP growth rates of 2.5 and 1.5% during FY2011-2020. If the GDP growth rate is as low as 1.0% until FY2010 under Case 3, the market will still grow to 24.5-24.9 trillion yen. The market will grow in all cases and in the highest growth case it will expand by 21 and 41% by FY2010 and 2020 compared to FY2000. The share of maintenance and repair will be 25.2% in FY2000 to 34.0% in 2010, and 38.1% in 2020 under the highest growth case.

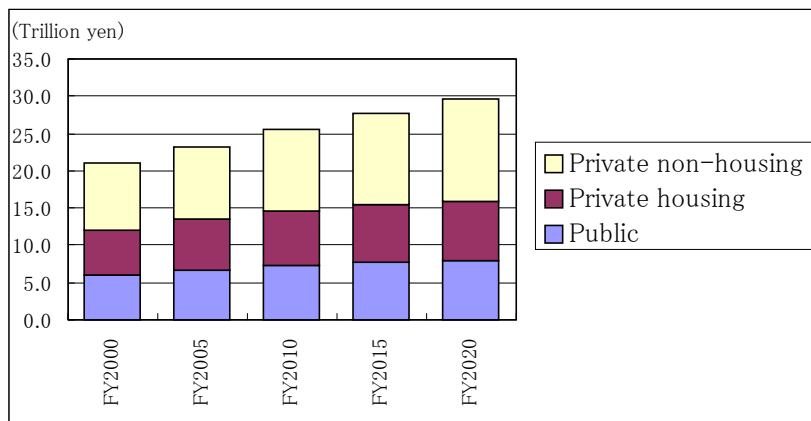
**Figure 5-19. Future Trends in Maintenance and Repair**

#### **Case 1: Assumed GDP growth rate: 2.0% during FY2001-2010; 2.5% during FY2011-2020**

- Growth of public construction investment: 0% during FY2001-2020

	(Trillion yen)				
	FY2000	FY2005	FY2010	FY2015	FY2020
Public	6.0	6.8	7.3	7.7	7.9

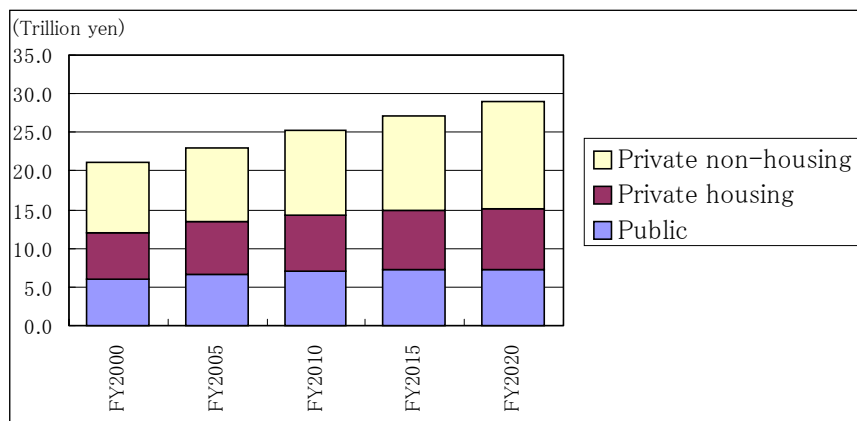
Private housing	6.1	6.8	7.3	7.7	7.9
Private non-housing	9.0	9.6	10.9	12.4	13.8
Total	21.1	23.2	25.5	27.8	29.6



• Growth of public construction investment: -2% during FY2001-2010; 0% during FY2011-2020

(Trillion yen)

	FY2000	FY2005	FY2010	FY2015	FY2020
Public	6.0	6.6	7.0	7.2	7.2
Private housing	6.1	6.8	7.3	7.7	7.9
Private non-housing	9.0	9.6	10.9	12.4	13.8
Total	21.1	23.1	25.2	27.2	28.9



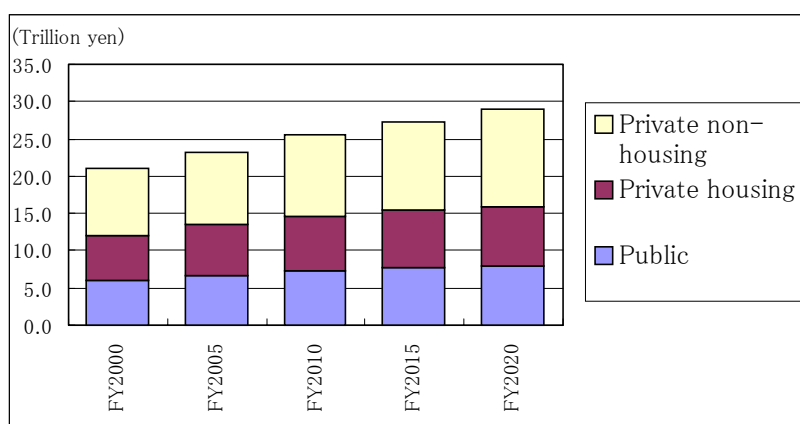
Case 2: Assumed GDP growth rate: 2.0% during FY2001-2010; 1.5% during FY2011-2020

Growth of public construction investment: 0% during FY2001-2020

(Trillion yen)

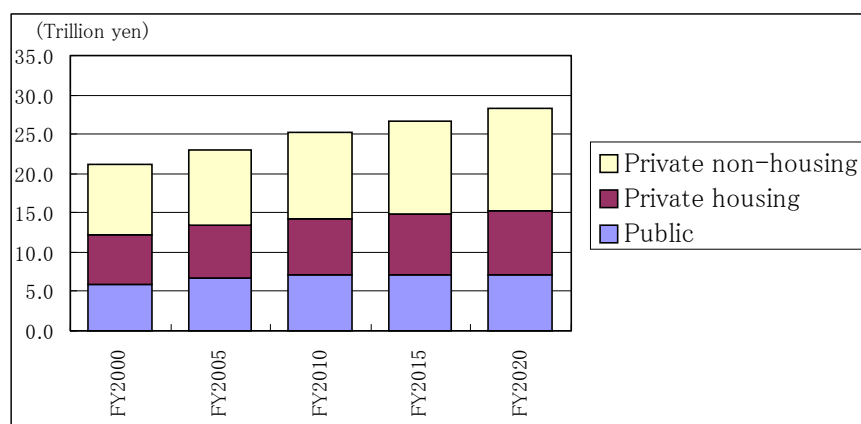
	FY2000	FY2005	FY2010	FY2015	FY2020
Public	6.0	6.8	7.3	7.7	7.9
Private housing	6.1	6.8	7.3	7.7	7.9
Private non-housing	9.0	9.6	10.9	11.9	13.1

Total	21.1	23.2	25.5	27.3	29.0
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Growth of public construction investment: -2% during FY2001-2010; 0% during FY2011-2020

	(Trillion yen)				
	FY2000	FY2005	FY2010	FY2015	FY2020
Public	6.0	6.6	7.0	7.2	7.2
Private housing	6.1	6.8	7.3	7.7	7.9
Private non-housing	9.0	9.6	10.9	11.9	13.1
Total	21.1	23.1	25.2	26.7	28.2



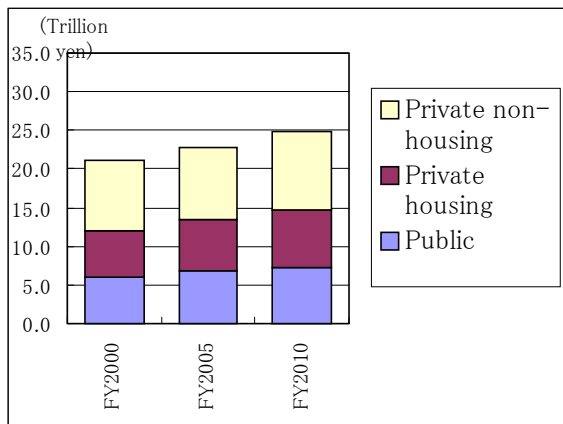
### Case 3: Assumed GDP growth rate: 1.0% during FY2001-2010

Growth of public construction investment: 0% during FY2001-2010

	(Trillion yen)		
	FY2000	FY2005	FY2010
Public	6.0	6.8	7.3
Private housing	6.1	6.8	7.3
Private non-housing	9.0	9.2	10.2



Total	21.1	22.7	24.9
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Growth of public construction investment: -2% during FY2001-2010

(Trillion yen)

	FY2000	FY2005	FY2010
Public	6.0	6.6	7.0
Private housing	6.1	6.8	7.3
Private non-housing	9.0	9.2	10.2
Total	21.1	22.6	24.5

