

# Actuarial Report

(21<sup>st</sup>)

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on the

## CANADA PENSION PLAN

As at 31 December 2003



Office of the Superintendent of  
Financial Institutions Canada

Bureau du surintendant des  
institutions financières Canada

Office of the Chief Actuary

Bureau de l'actuaire en chef

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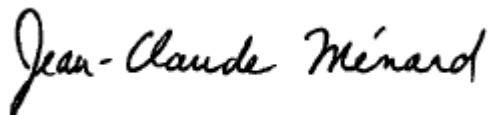
18 November 2004

The Honourable Ralph Goodale, P.C., M.P.  
Minister of Finance  
House of Commons  
Ottawa, Canada  
K1A 0G5

Dear Minister:

In accordance with section 115 of the *Canada Pension Plan*, which provides that an actuarial report shall be prepared every three years for purposes of the contribution rate review by the Minister of Finance and the ministers of the Crown of the provinces, I am pleased to submit the Twenty-First Actuarial Report on the Canada Pension Plan, prepared as at 31 December 2003.

Yours sincerely,

A handwritten signature in black ink that reads "Jean-Claude Ménard". The signature is written in a cursive, flowing style.

Jean-Claude Ménard, F.S.A., F.C.I.A.  
Chief Actuary



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## **I. Executive Summary**

This is the Twenty-First Actuarial Report since the inception of the Canada Pension Plan (CPP) in 1966. It presents the financial status of the Plan as at 31 December 2003. The previous triennial report is the Eighteenth Actuarial Report as at 31 December 2000, which was tabled in the House of Commons on 10 December 2001.

The Canada Pension Plan was subject to a series of amendments since the Eighteenth Actuarial Report pursuant to the adoption of Bill C-3 and Part 4 of Bill C-30. The effects of these amendments were covered in the Nineteenth and Twentieth Actuarial Reports, which were tabled 17 June 2002 and 20 April 2004, respectively, in the House of Commons. Part 4 of Bill C-30 received Royal Assent on 14 May 2004. According to the legislation, the coming into force of CPP amendments requires the formal approval of at least two-thirds of the provinces representing two-thirds of the population. This is in process and should be completed in due course. The effects of Bill C-3 and Part 4 of Bill C-30 are included in the financial projections of this report.

### **A. Purpose of the Report**

This report has been prepared in compliance with the timing and information requirements of the *Canada Pension Plan*. Section 113.1 of the Act provides that the Minister of Finance and ministers of the Crown of the provinces shall review the state of the CPP once every three years, and may consequently make recommendations to change the benefits or contribution rates, or both. Section 113.1 identifies the factors they consider in their review, including information to be provided by the Chief Actuary.

Another important purpose of the report is to inform contributors and beneficiaries of the current and projected financial status of the Plan. It provides information to evaluate its financial sustainability over a long period, assuming the Act remains unchanged. Such information should facilitate a better understanding of the financial status of the Plan and the factors that influence costs, contributing to an informed public discussion of issues related to it.

### **B. Scope of the Report**

Section II presents the general methodology used in preparing the actuarial estimates included in this report, which are based on the key “best-estimate” assumptions described in Section III. Section IV includes the projections of the income, expenditures and assets of the Plan over the next 75 years. Section V summarizes the financial results under alternative younger and older population scenarios. The impact of financial markets volatility on the financial status of the Plan is also examined.

Section VI presents a general conclusion about the financial status of the Plan, while Section VII consists of the actuarial opinion. The various appendices provide for supplemental information on the provisions of the Plan, the description of the data, the assumptions and methods employed, the sensitivity analysis and the long-term financial sustainability of the Plan. The reconciliation of the results with those presented in the Eighteenth Report and the financial results under the steady-state contribution rate are also shown.

## C. Main Findings

The results of the actuarial projections of the financial status of the Canada Pension Plan presented in this Twenty-First Report are generally consistent with the trends revealed in the previous triennial actuarial report.

- Demographic changes will have a major impact on the ratio of workers to retirees; the ratio of the number of people aged 20 to 64 to those aged 65 and over is expected to fall from about 4.9 in 2004 to 2.3 in 2050.
- The pay-as-you-go rate is expected to increase steadily from 8.3% in 2004 to 11.3% by 2050, mainly driven by the retirement of the baby boom generation.
- The steady-state contribution rate, which is the lowest rate sufficient to sustain the Plan without further increase, is 9.8% of contributory earnings. This rate is the same as presented in the previous triennial actuarial report and 0.1% lower than the legislated 9.9% contribution rate.
- With the 9.9% legislated contribution rate, the assets are expected to increase significantly over the next 17 years, with the ratio of assets to the following year's expenditures growing from 3.1 in 2004 to 5.6 by 2021.
- Total assets are expected to grow from \$68 billion at the end of 2003 to \$147 billion by the end of 2010.
- During the period 2004 to 2021, contributions are more than sufficient to cover the expenditures. Thereafter a proportion of the investment earnings is required to make up the difference between contributions and expenditures. In 2050, the proportion of investment earnings is 29%.
- Investment earnings, which represent 14% of revenues (i.e. contributions and investment earnings) in 2004, will represent 27% thereof in 2020. In 2050, investment earnings represent 32% of revenues. This clearly illustrates the importance of the investment earnings as a source of revenues to the Plan.

## D. General Conclusions

The results contained in this report confirm that the legislated contribution rate of 9.9% in 2004 and thereafter is sufficient to pay for future expenditures and to accumulate assets worth \$147 billion (i.e. 4.4 times the annual expenditures) in 2010. In 2050, the assets are projected to be \$1,554 billion or 6.3 times the annual expenditures.

The steady-state contribution rate determined under this report is 9.8%. Better than anticipated economic experience, especially regarding labour force participation and employment data, over the period 2001 to 2003, combined with the amendments since the last report have put downward pressure on the steady-state contribution rate. On the other hand, a more pessimistic demographic outlook, due to the continuing downward trend in fertility rates and increases in longevity, combined with lower expectations with respect to inflation and rates of return on investments have put upward pressure on the steady-state contribution rate. These factors tend to counterbalance each other, leaving the steady-state rate unchanged at 9.8%.

To measure the sensitivity of the long-term projected financial position of the Plan to changes in the future economic and demographic outlook, two demographically based scenarios that portray a generally younger and older population were developed. The younger and older population scenarios produced steady-state contribution rates of 9.3% and 10.3%, respectively.

Under the 9.9% legislated contribution rate, the assets are projected to grow rapidly over the next 17 years as contribution revenues are expected to exceed the expenditures over that period. Assets will continue to grow until the end of the projection period, but at a slower pace, and the ratio of assets to the following year's expenditures (asset/expenditure ratio) is expected to reach a level of 6.3 by 2050. These are indicators that the Plan is sustainable over the long term, as it is projected that there will be more cash inflows than outflows over the entire projection period. The pool of assets generated over the projection period provides the Plan with the capacity, through investment earnings, to absorb a wide range of unforeseen economic or demographic fluctuations, which otherwise would have to be reflected in the legislated contribution rate. Thus, despite the projected substantial increase in benefits paid as a result of an aging population, the Plan is expected to be able to meet its obligations throughout the projection period.

## II. Methodology

The actuarial examination of the Canada Pension Plan involves projections of its revenues and expenditures over a long period of time, so that the future impact of historical and projected trends in demographic and economic factors can be properly assessed. The actuarial estimates in this report are based on the current provisions of the Plan, data regarding the starting point for the projections, “best-estimate” assumptions regarding future demographic and economic experience, and a methodology for translating this information into estimates of future revenues and expenditures.

The revenues of the Plan include both contributions and investment earnings. The projection of contributions begins with a projection of the working-age population. This requires assumptions regarding demographic factors such as fertility, migration and mortality. Total contributory earnings are derived by applying labour force participation and job creation rates to the projected population and by projecting future employment earnings. This requires assumptions such as wage increases, an earnings distribution and unemployment rates. Contributions to the Plan are obtained by applying the contribution rate to contributory earnings. Investment earnings are projected on the basis of the existing portfolio of assets, projected net cash flows and the assumed rates of return on investments.

Expenditures are made up of the benefits paid out and administrative expenses. Newly emerging benefits are projected by applying demographic assumptions regarding retirement, disability and death to the eligible populations, together with the benefit provisions and the earnings histories of the participants. The projection of total benefits, which include the continuation of benefits already in payment at the valuation date, requires further assumptions, along with an assumption regarding the rate of increase in prices. Administrative expenses are projected based on historical experience. The assets at the end of any year are thus determined by adding the excess of revenues over expenditures for the given year to the assets at the end of the previous year.

The assumptions and results presented in the following sections make it possible to measure the financial status of the Plan in each projection year and to calculate a steady-state contribution rate. The steady-state contribution rate is defined as the lowest level contribution rate applicable after the end of the review period, rounded to the nearest 0.1% that results in the asset/expenditure ratio being the same in the 10<sup>th</sup> and 60<sup>th</sup> year following the end of the review period. For this Report, the end of the review period is 2006. Therefore, the steady-state contribution rate is applicable for years 2007 and thereafter and the relevant years for the determination of the steady-state contribution rate are 2016 and 2066.

A wide variety of factors influence both the current and projected financial position of the Plan. Accordingly, the results shown in this report differ from those shown in previous reports. Likewise, future actuarial examinations will reveal results that differ from the projections included in this report.

### **III. Best-Estimate Assumptions**

#### **A. Introduction**

The information required by statute, which is presented in Section IV, requires making several assumptions regarding future demographic and economic trends. The projections included in this report cover a long period of time (75 years) and the assumptions are determined by putting more emphasis on historical trends than on short-term trends. These assumptions reflect our best judgement and are referred to in this report as the “best-estimate” assumptions. The assumptions were chosen to form a coherent whole, taking into account certain interrelationships among them.

An independent panel of actuaries reviewed the Eighteenth Actuarial Report and released a report in March 2002. The Review Panel supported the actuarial conclusions reached by the Chief Actuary about the soundness of the Canada Pension Plan. The Review Panel found that the Eighteenth Actuarial Report was prepared in accordance with professional standards, and that the assumptions used by the Chief Actuary were reasonable and within acceptable ranges. The Review Panel report made a series of recommendations dealing with data, methodology, assumptions and communication of results. For the Twenty-First Actuarial Report, the Office of the Chief Actuary (OCA) took action on those recommendations.

The Chief Actuary held a seminar on the demographic and economic outlook for Canada to get opinions from a wide range of individuals with relevant expertise. The seminar was held in May 2003. Four experts in the fields of demography, economics and investments were invited to present their views. Amongst the participants at the seminar were representatives of the OCA, Social Development Canada and the Department of Finance, as well as representatives of provincial and territorial governments. Furthermore, representatives of the OCA attended a seminar held by the Québec Pension Plan (QPP) in September 2003. The various papers presented at both seminars are available from the OCA’s website.

Table 1 below presents a summary of the most important assumptions used in this report and those used in the previous triennial report. The assumptions are described in more detail in Appendix B of this report.

**Table 1 Best-Estimate Demographic and Economic Assumptions**

Canada	21 <sup>st</sup> Report (as at 31 December 2003)			18 <sup>th</sup> Report (as at 31 December 2000)		
	Total fertility rate	1.60			1.64	
Net migration rate	0.50% of population to 2015 0.54% of population for 2020+			0.50% of population to 2015 0.52% of population for 2020+		
Mortality	1995-97 Life Tables for Canada with future improvements			1990-92 Life Tables for Canada with future improvements		
Canadian life expectancy at birth		<u>2005</u>	<u>2025</u>		<u>2005</u>	<u>2025</u>
	Males	78.0 years	80.7 years	Males	77.0 years	78.8 years
	Females	82.6 years	84.1 years	Females	82.0 years	83.2 years
CPP disability incidence rates (per 1,000 eligible)	Males	3.25		Males	3.25*	
	Females	3.50		Females	2.75*	
Unemployment rate	6.5% (2020)			6.5% (2015)		
Participation rate (aged 15-69)	73.4% (2030)			72.5% (2030)		
Employment rate (aged 15-69)	68.6% (2030)			66.5% (2030)		
Real-wage differential	1.2% (2012+)			1.1% (2015+)		
Rate of increase in prices	2.7% (2015+)			3.0% (2015+)		
Real rates of return	4.1% (2011+)			4.2% (2011+)		

\* The disability incidence rates are not comparable between the two reports since the methodology has been changed. The 18<sup>th</sup> CPP Report rates would have been higher using the new methodology (see Appendix B, section V-E).

## B. Demographic Assumptions

The demographic projections start with the Canada and Québec populations on 1 July 2003, to which are applied fertility, migration and mortality assumptions. The relevant population for the Canada Pension Plan is Canada less Québec and is obtained by subtracting the projected results for Québec from those for Canada. The population projections are essential to determine the future number of CPP contributors and beneficiaries.

The distribution by age of the population of Canada less Québec has changed considerably since the inception of the Plan in 1966, with the population aging each year since then. The causes of this aging are examined in the following subsections.

## 1. Fertility

The first cause of the aging of the Canadian population is the large drop in the total fertility rate over the last three decades, relative to the baby boom generation born between the mid-1940s to the mid-1960s. The fertility rate in Canada has dropped rapidly from an average level of about 4.0 per woman in the 1950s to 1.75 in the late 1970s and to 1.62 over the last two decades. The same observations can be made for Québec except that fertility rates are slightly lower.

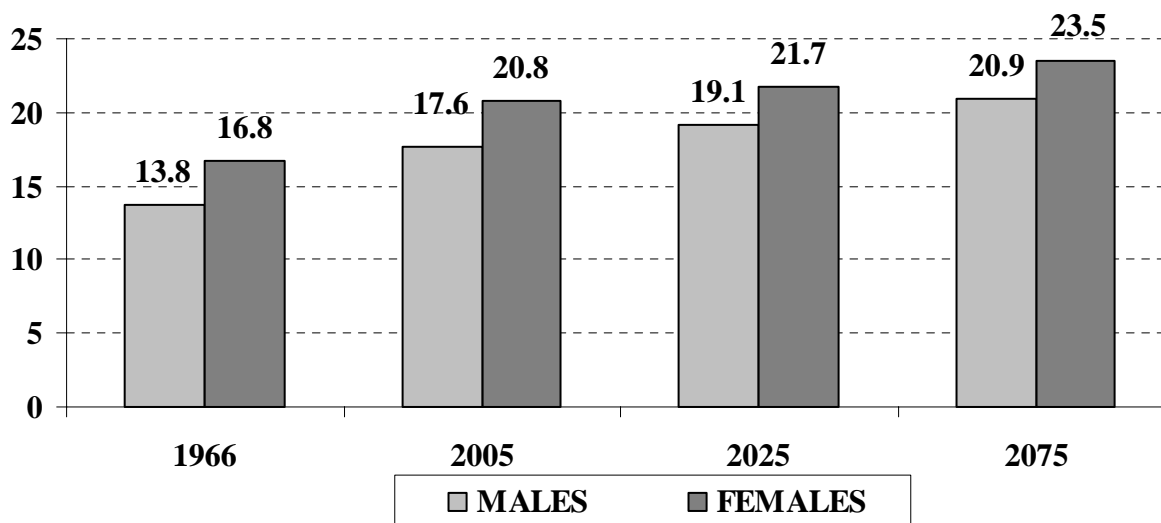
The decrease occurred as a result of changes in a variety of social, medical and economic factors. It is unlikely that fertility rates will return to historical levels in the absence of significant societal changes. It is assumed that the total fertility rate for Canada will increase slightly from its 2001 level of 1.51 (1.45 in 2002 for Québec) to an ultimate level of 1.60 in 2016 (1.55 in 2017 for Québec). As a result, the total fertility rate for Canada less Québec is assumed to be 1.61 in 2017 and thereafter.

## 2. Mortality

Another element that has contributed to the aging of the population is the significant reduction in age-specific mortality rates. This can be best measured by the increase in life expectancy at age 65, which directly affects how long retirement benefits will be paid to the beneficiaries. Life expectancy at age 65 has increased 24% for men between 1966 and 2001, rising from 13.8 to 17.1 years. For women, life expectancy at age 65 has increased 23%, from 16.8 to 20.6 years over the same period.

Mortality improvements are expected to continue in the future, but at a slower pace than observed over the last 25 years. The ultimate rates of improvement were established by adjusting the results of a detailed study prepared by the Social Security Administration in the United States. The adjustments are to reflect, in part, historical differences between Canada and the United States. Rates of improvement for the period 2002 to 2006 are assumed to be equal to those experienced over the period 1991 to 2001 and then gradually reduce to their ultimate levels by year 2026. Chart 1 shows the changes in life expectancy at age 65 since the Plan inception in 1966 to the end of the projection period.

**Chart 1 Trend in Life Expectancy at Age 65**  
 (Canada)



### 3. Net Migration

Net migration (i.e. the excess of immigration over emigration) is unlikely to materially reduce the continued aging of the population unless (1) the level of immigration rises significantly above what has been observed historically and (2) the average age at immigration falls dramatically.

Net migration to Canada was 0.45% of the population in 2003 and has averaged 0.50% of the population over the last 30 years. Based on a continuation of these net migration levels and the expected pressure on the labour markets due to the impending retirement of the baby boom generation, an ultimate assumption of 0.54% of population has been established for years 2020 and beyond. The initial level of 0.50% is kept constant from 2004 until 2015, then increases uniformly to reach an ultimate level of 0.54% for 2020 and thereafter to take into account the effects of the anticipated labour shortage. The ultimate 0.54% is comparable to actual averages observed over the last 10 and 15 years. To project the Québec population, a net migration rate of about 0.4% is assumed over the projection period.

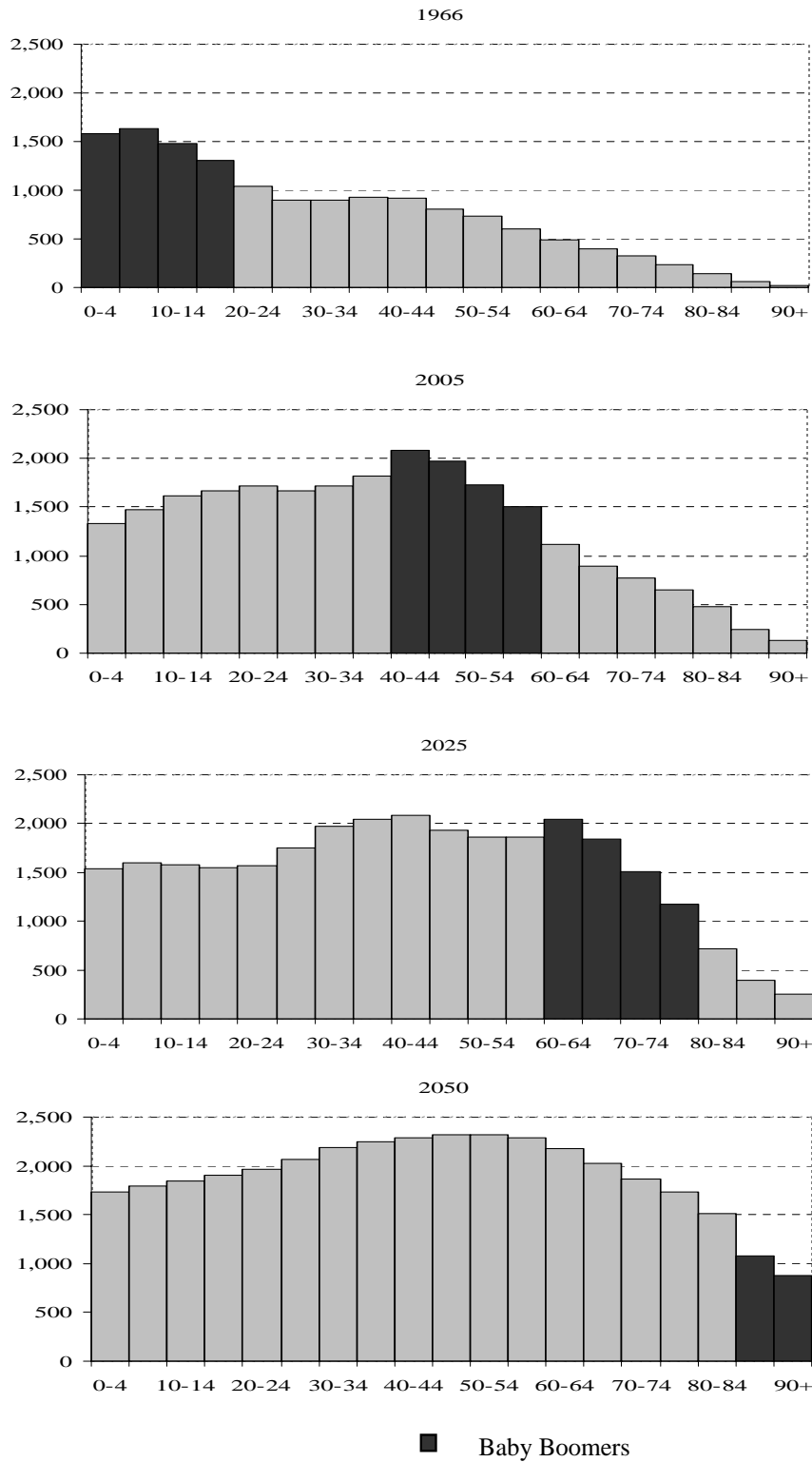
### 4. Population Projections

Chart 2 shows the evolution of the Canada less Québec population age distribution since the inception of the Plan. One can easily observe that the triangular shape of the 1970s is becoming more rectangular, thus leading to an older population on average. The effects of the baby boom and baby bust can be seen. The chart also reveals that the number of people aged 85 and over is expected to increase dramatically over the next 50 years.

Table 2 shows the population for three age groups (0-19, 20-64 and 65 and over) over the projection period. The ratio of people aged 20-64 to those aged 65 and over is a measure that approximates the number of working-age people to retirees. Because of the population aging, this ratio drops by more than half during the projection period, from 4.9 in 2004 to 2.3 in 2050.



**Chart 2 Population Distribution of Canada less Québec  
 (thousands)**



**Table 2 Population of Canada less Québec**  
 (thousands)

<b>Year</b>	<b>Total</b>	<b>Age 0-19</b>	<b>Age 20-64</b>	<b>Age 65 and Over</b>	<b>Ratio of 20-64 to 65 and Over</b>
<b>2004</b>	24,366	6,120	15,131	3,116	4.9
<b>2005</b>	24,590	6,079	15,337	3,174	4.8
<b>2006</b>	24,813	6,042	15,530	3,240	4.8
<b>2007</b>	25,037	6,015	15,711	3,311	4.7
<b>2008</b>	25,261	5,994	15,873	3,394	4.7
<b>2009</b>	25,487	5,970	16,038	3,479	4.6
<b>2010</b>	25,714	5,939	16,210	3,566	4.5
<b>2015</b>	26,879	5,889	16,760	4,230	4.0
<b>2020</b>	28,104	6,028	17,071	5,004	3.4
<b>2025</b>	29,273	6,261	17,115	5,897	2.9
<b>2030</b>	30,315	6,439	17,103	6,774	2.5
<b>2040</b>	31,937	6,526	17,822	7,590	2.3
<b>2050</b>	33,190	6,692	18,381	8,117	2.3
<b>2075</b>	36,228	7,279	19,863	9,085	2.2

### **C. Economic Assumptions**

The main economic assumptions related to the Canada Pension Plan are the labour force participation rates, employment rates, unemployment rates and average employment earnings increases. For benefit and asset projection purposes, assumptions regarding the rate of increase in prices and rates of return on invested assets are also required.

One of the key elements underlying the best-estimate key economic assumptions relates to the expected labour shortage due to the aging of the population and the retirement of the baby boom generation between 2010 and 2030. Labour force growth will weaken as the working age population expands at a slower pace. The outlook for the participation rates also points to slower labour force growth. Growing labour shortages, especially after 2010, are assumed to force higher real wage growth. The higher real wages may help keep people in the labour force who might otherwise retire. The net result is a small reduction in the unemployment rate.

#### **1. Labour Force**

Employment levels are reflected in the projections through the assumption regarding the proportions of the population, by age and sex, who have earnings in a given year. These proportions vary not only with the rate of unemployment, but also reflect trends to increased workforce participation by women, longer periods of formal education among young adults and changing retirement patterns of older workers.

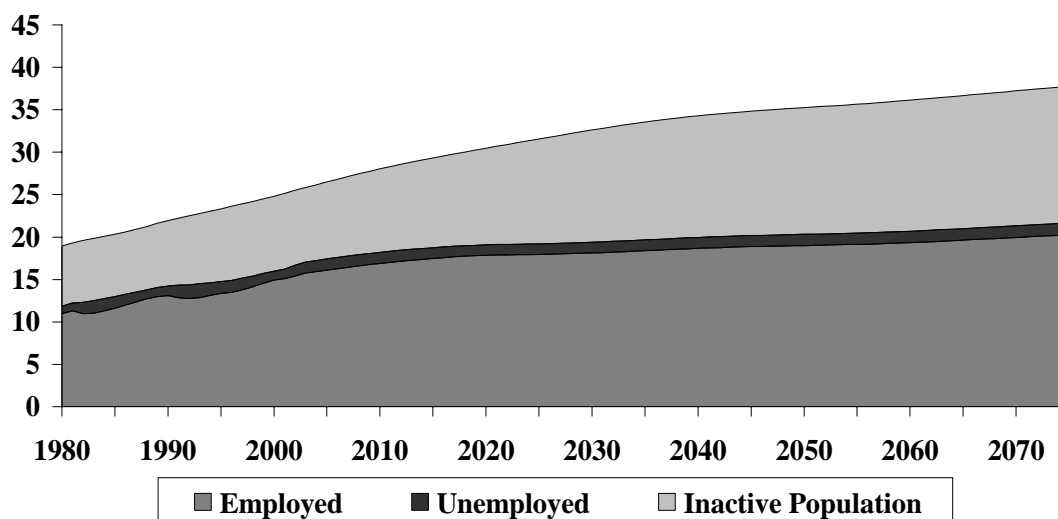
Because of the aging of the population, the labour force participation rates for Canadians aged 15 and over are expected to decline from 67.4% in 2004 to 61.1% by 2030. A more useful measure of the working age population is the participation rates of those aged 15 to 69, which are expected to decline from 74.9% in 2004 to 73.4% in 2030. The participation rates of those aged 60 to 69 are gradually increased after 2003. Moreover, the narrowing of the gap between the age-specific participation rates of men and women continues but at a much slower pace than in the past, except for certain age groups.

Recent significant increases were experienced in both younger and older age groups for both males and females. Rates for females aged 15 to 19 increased more than for males recently, and this trend is projected to stabilize at a difference of 1% in the near term. In the early part of the projection period, the gap between male and female rates increases slightly for some age groups as male rates are projected to increase slightly faster; however, over the long term the gap is projected to decrease for all groups except for the group aged 15 to 19. Overall, rates for females aged 15 to 69 are projected to increase more than for males, primarily for those aged 30 to 49.

The job creation rate in Canada was 1.8% on average from 1976 to 2003, based on available employment data; it is assumed that the number of jobs increases by 1.2% in 2004. From 2005 to 2010, the job creation rate is about 1.0% on average and 0.6% from 2010 to 2020. For 2020 and thereafter, because of the aging of the population, the job creation rate follows the labour force growth rate of about 0.3%.

The job creation rate is determined on the basis of the short-term economic outlook and the unemployment rate, which averages about 7.5% from 2004 to 2008. Thereafter, the relative stability of the labour force makes it possible for the unemployment rate to decrease to 6.5% around 2020.

**Chart 3 Distribution of the Canadian Population Aged 15 and Over**  
 (millions)



As shown in Chart 3, the number of employed aged 15 and over increases from about 11.0 million in 1980 to 19.0 million by 2050. At the start of the projection period in 2004, employment is set to reach 15.9 million. As annual employment growth is projected to decline gradually to about 0.3%, the average annual increase in employment from 2004 to 2050 reduces to 0.4%. The number of unemployed aged 15 and over increases from approximately 0.9 million in 1980 to 1.3 million in 2050.

The labour force or the active population (that is, total employed and unemployed populations) thus increases from 11.9 million in 1980 to 17.2 million in 2004 and then to 20.3 million in 2050, which gives an average annual increase of 0.4% from 2004 to 2050. Correspondingly, the inactive population (those not in the labour force) aged 15 and over increases from 6.6 million in 1980 to 8.3 million in 2004 and then to 13.9 million in 2050, which gives an average annual increase of 1.1% from 2004 to 2050.

The combined impact of a decrease in the labour force participation rate and a gradual increase in the population aged 15 and over leads to an overall moderate increase in the labour force. The labour force grows at a slower rate than the population and the overall participation rate decreases because of the aging of the population, as shown in Chart 3.

## **2. Price Increases**

Price increases, as measured by changes in the Consumer Price Index, tend to fluctuate from year to year. Based on historical trends, the renewed commitment of the Bank of Canada and the Government to keep inflation between 1% and 3% until 2006 and long-term economic forecasts, an ultimate rate of price increase of 2.7% has been assumed for 2015 and thereafter. Recognizing recent experience, the rate of price increase is assumed at 2.0% for years 2004 to 2008. From 2009, the rate is then uniformly increased to its ultimate level of 2.7% in 2015.

## **3. Real Wage Increases (Average Annual Earnings)**

Wage increases impact the financial balance of the Canada Pension Plan in two ways. In the short term, an increase in the average wage translates into higher contribution income, with little immediate impact on benefits. Over the longer term, higher average wages produce higher benefits. The long-term projected financial status of the Plan is more dependent on the differential between the assumed annual rate of wage increases and price increases (the real-wage differential) than on the level of wage increases.

Many factors have influenced the real rate of increase in average annual wages, including general productivity improvements, the move to a service economy, decreases in the average hours worked and fluctuation in the size of the workforce. Considering these factors, together with the historical trends, the expected labour shortage and various long-term economic forecasts, an ultimate real wage differential of 1.2% is assumed for 2012 and thereafter. Combined with the price increase assumption described above, this results in an assumed annual increase in wages of 3.9% in 2015 and thereafter.

Furthermore, the current difference between the real rate of increase in the Average Weekly Earnings (AWE) used in the projection of the Year's Maximum Pensionable Earnings (YMPE) and the real rate of increase in the average annual earnings (AAE) has been recognized. However, consistent with the long-term relationship between the real increases in the AWE and AAE, the difference is assumed to reduce to zero over the next five years. Taking into account the latest trends in the AWE, the real increase in AWE is assumed at -0.3% for 2004. For 2005, the real increase in AWE is assumed at 0.2% and then is gradually increased to reach 1.2% by 2012. For the period 2004 to 2007, the real increase in AAE is assumed to outpace increases in the AWE. For 2008 and thereafter, the AAE is increased at the same rate as for the AWE.

The assumed increase in AAE and in the proportions of earners results in projected average annual real increases in total employment earnings of about 1.7% for the period 2004 to 2020. This decreases to about 1.5% ultimately, reflecting the 1.2% real increase in annual wages and the 0.3% annual growth in the working-age population.

#### **4. Rates of Return on Investments**

The assets of the Canada Pension Plan consist of three components, as follows:

- the Account, which corresponds to three months of benefit payments;
- the Fund, which consists of 20-year loans to the provinces; and
- the assets invested by the CPP Investment Board.

The CPP Account and Fund assets held by the federal Department of Finance will be transferred to the CPP Investment Board beginning in the year 2004. The transfer of the Fund began in May 2004 and will take three years to complete. The transfer of the Account began in September 2004 and will take one year to complete.

The real rates of return are the excess of the nominal rates of return over the rates of price increase. For the Account component, which mainly consists of short-term investments, the real rate of return is assumed at 0.5% for 2004 and 1.0% for 2005. For the Fund component, which mainly consists of provincial long-term bonds, an ultimate real rate of return of 3.25% on new bonds has been assumed. The assumed long-term real rate of return on CPP assets takes into account the asset mix of investments for the three components. The real rates of return on investments are net of administrative and investment expenses.

The initial real rate of return reflects recently observed yields for the first six months of 2004. For the period of 2005 to 2025, the real rates of return are slightly higher than the assumed ultimate real rate of return of 4.1% due to the higher returns assumed for the Fund component (see Table 44). The long-term level of the real rate of return on CPP assets is in line with historical yields for large pension plans. Table 3 summarizes the main economic and investment assumptions over the projection period.

**Table 3 Economic and Investment Assumptions**

Year	Real Increase Average Annual Earnings (%)	Real Increase Average Weekly Earnings (%)	Price Increase (%)	Labour Force			Labour Force Annual Increase (%)	Real Rate of Return on Investments (%)
				Participation Rate (%)	Job Creation Rate (%)	Unemployment Rate (%)		
<b>2004</b>	0.1	(0.3)	2.0	67.4	1.2	7.6	1.1	4.4
<b>2005</b>	0.3	0.2	2.0	67.3	1.1	7.6	1.1	5.0
<b>2006</b>	0.5	0.4	2.0	67.2	1.1	7.6	1.0	5.0
<b>2007</b>	0.7	0.6	2.0	67.0	1.0	7.5	0.9	4.8
<b>2008</b>	0.8	0.8	2.0	66.8	1.0	7.3	0.8	4.7
<b>2009</b>	0.9	0.9	2.1	66.6	0.9	7.3	0.8	4.5
<b>2010</b>	1.0	1.0	2.2	66.4	0.9	7.2	0.8	4.4
<b>2011</b>	1.1	1.1	2.3	66.2	0.8	7.2	0.8	4.3
<b>2012</b>	1.2	1.2	2.4	66.0	0.8	7.1	0.7	4.2
<b>2013</b>	1.2	1.2	2.5	65.8	0.7	7.0	0.6	4.2
<b>2014</b>	1.2	1.2	2.6	65.6	0.7	6.8	0.5	4.2
<b>2015</b>	1.2	1.2	2.7	65.4	0.6	6.7	0.5	4.2
<b>2020</b>	1.2	1.2	2.7	64.2	0.3	6.5	0.3	4.2
<b>2025</b>	1.2	1.2	2.7	62.4	0.1	6.5	0.1	4.1
<b>2030</b>	1.2	1.2	2.7	61.1	0.2	6.5	0.2	4.1
<b>2040</b>	1.2	1.2	2.7	60.0	0.3	6.5	0.3	4.1
<b>2050</b>	1.2	1.2	2.7	59.4	0.1	6.5	0.1	4.1

#### D. Other Assumptions

This report includes several other assumptions, such as the retirement rates and the disability incidence rates.

##### 1. Retirement Rates

The sex-distinct retirement rates for any given age between 60 and 70 correspond to the number of emerging retirement beneficiaries divided by the product of the population and the retirement benefit eligibility rates for the given age.

The normal retirement age under the Canada Pension Plan is 65. However, since 1987 a person can choose to receive a reduced retirement pension as early as age 60. This provision has lowered the average age at benefit uptake from 65.2 in 1986 to 62.1 in 2003.

There exists a relationship between retirement rates and labour force participation rates in the age group 60 to 64. In this report, it is assumed that the participation rate for males aged 60 to 64 will increase from 53% in 2004 to 56% in 2030 while for females the increase, over the same period, is from 32% to 36%. In light of this, retirement rates at age 60 are adjusted downward by one-third of the increase in participation rates for ages

60 to 64 between 2004 and 2030 while retirement rates at age 65 are increased by the same amount.

Retirement rates in 2004 at age 60 are 33% and 40% for males and females, respectively. These rates are thus assumed to gradually decrease to reach levels of 32% and 38% in 2030 for males and females, respectively. The retirement rates are then held constant for 2030 and thereafter.

## **2. Disability Incidence Rates**

The sex-distinct disability incidence rates at any given age are the number of new disability beneficiaries divided by the total number of people eligible for the disability benefit. Based on the historical Plan experience, the ultimate overall incidence rates for years 2008 and thereafter have been assumed at 3.25 per thousand eligible for males and at 3.50 per thousand eligible for females. These rates are not directly comparable to the Eighteenth CPP Actuarial Report assumed incidence rates since the methodology has been changed (refer to Appendix B, section V-E).

The assumption recognizes in part that incidence rates have significantly declined since 1992. However, the rate of decline has slowed down since 1998 and there has been a slight increase over the last few years. The assumption also recognizes that the overall incidence rate for females has recently been somewhat higher than for males.

## IV. Results

### A. Overview

The results of the actuarial projections of the financial status of the Canada Pension Plan presented in this report are generally consistent with the trends revealed in the previous triennial actuarial report. The key observations and findings are as follows.

- Demographic changes will have a major impact on the ratio of workers to retirees; the ratio of the number of people aged 20 to 64 to those aged 65 and over is expected to fall from about 4.9 in 2004 to 2.3 in 2050.
- The pay-as-you-go rate is expected to increase steadily from 8.3% in 2004 to 11.3% by 2050, mainly driven by the retirement of the baby boom generation.
- The steady-state contribution rate, which is the lowest rate sufficient to sustain the Plan without further increase, is 9.8% of contributory earnings. This rate is the same as presented in the previous actuarial report and 0.1% lower than the legislated 9.9% contribution rate.
- With the 9.9% legislated contribution rate, the assets are expected to increase significantly over the next 17 years, with the ratio of assets to the following year's expenditures growing from 3.1 in 2004 to 5.6 by 2021.
- Total assets are expected to grow from \$68 billion at the end of 2003 to \$147 billion by the end of 2010.
- As a result of Bill C-3, total assets under the management of the CPP Investment Board is expected to grow from \$31 billion, which represents 46% of total assets in 2003, to \$109 billion (100% of total assets) by the end of 2007.

### B. Contributions

Projected contributions are the product of the contribution rate, the number of contributors and the average contributory earnings. The contribution rate is set by law and is 9.9% for 2004 and thereafter.

The number of contributors by age and sex is directly linked to the assumed labour force participation rates applied to the projected working-age population, and the job creation rates. Hence, the demographic and economic assumptions described in the preceding sections have a great influence on the expected level of contributions. In this report, the number of CPP contributors increases continually throughout the projection period from 11.7 million in 2004 to 13.8 million by 2025, after which the increases are limited due to the lower growth in the working age population and labour force. The growth in contributory earnings, which are derived by subtracting the Year's Basic Exemption (YBE) from pensionable earnings, is linked to the growth in average employment earnings through the assumption regarding annual increases in wages and is affected by the freeze on the YBE since 1998. The projected average contributory earnings in 2004 are \$26,325 for men and \$21,805 for women.



Contributions are expected to be \$28.6 billion in 2004 and since the legislated contribution rate is constant at 9.9% for years 2004 and thereafter, contributions increase at the same rate as the total contributory earnings over the projection period. Table 4 presents the projected components of total contributions.

**Table 4 Contributions**

<b>Year</b>	<b>Contribution Rate</b> (%)	<b>Number of Contributors</b> (thousands)	<b>Contributory Earnings</b> (\$ million)	<b>Contributions</b> (\$ million)
<b>2004</b>	9.9	11,716	288,970	28,608
<b>2005</b>	9.9	11,871	298,643	29,566
<b>2006</b>	9.9	12,028	309,772	30,667
<b>2007</b>	9.9	12,172	322,095	31,887
<b>2008</b>	9.9	12,317	335,376	33,202
<b>2009</b>	9.9	12,455	349,556	34,606
<b>2010</b>	9.9	12,596	364,926	36,128
<b>2015</b>	9.9	13,194	460,396	45,579
<b>2020</b>	9.9	13,609	581,181	57,537
<b>2025</b>	9.9	13,790	718,640	71,145
<b>2030</b>	9.9	14,040	888,999	88,011
<b>2040</b>	9.9	14,764	1,376,157	136,240
<b>2050</b>	9.9	15,284	2,097,524	207,655

### C. Expenditures

The projected number of total beneficiaries by type of benefit is given in Table 5, while Table 6 presents the same information for males and females separately.

The number of retirement, disability and survivor beneficiaries increases throughout the projection period. In particular, due to the aging of the population, the number of retirement beneficiaries is expected to more than double over the next 25 years. In 2004, there are 2% fewer female retirement beneficiaries than male retirement beneficiaries, but by 2006 the numbers are equal and by 2050 the females outnumber the males by 15%. Over the same period, the number of disability and survivor beneficiaries increases but at a much slower pace than retirement beneficiaries.

Tables 7 and 8 show the amounts of projected expenditures by type. Projected expenditures in 2004 are \$23.9 billion and reach \$31.9 billion in 2010. Table 9 shows the projected expenditures by type expressed as a percentage of contributory earnings. They are referred to as the pay-as-you-go rates. The pay-as-you-go rate is expected to increase significantly from its current level of 8.3% in 2004 to 11.3% by the end of the projection period.

**Table 5 Beneficiaries**  
(thousands)

Year	Retirement*	Disability	Survivor**	Children	Death***
2004	3,152	344	1,008	224	113
2005	3,254	351	1,030	224	117
2006	3,366	360	1,051	224	120
2007	3,500	369	1,071	225	124
2008	3,642	378	1,091	225	127
2009	3,784	387	1,111	225	131
2010	3,930	397	1,130	224	135
2015	4,792	429	1,222	223	154
2020	5,748	455	1,321	226	175
2025	6,747	462	1,438	236	201
2030	7,550	457	1,579	249	231
2040	8,437	499	1,879	266	293
2050	9,090	526	2,069	264	329

\* The number given for retirement beneficiaries does not take into account that the retirement pension can be shared between spouses.

\*\* A beneficiary who receives concurrently a retirement and a survivor pension are counted in each category.

\*\*\* This is the number of deceased contributors giving entitlement to a death benefit during the given year.

**Table 6 Beneficiaries by Sex**  
(thousands)

Year	Males				Females			
	Retirement*	Disability	Survivor**	Death***	Retirement*	Disability	Survivor**	Death***
2004	1,593	170	152	75	1,559	175	856	39
2005	1,636	172	158	76	1,618	180	872	40
2006	1,684	175	164	78	1,682	185	887	42
2007	1,742	178	170	79	1,758	191	902	44
2008	1,805	182	176	81	1,837	196	916	46
2009	1,868	186	182	83	1,917	201	929	48
2010	1,932	190	188	85	1,998	207	942	50
2015	2,321	204	218	94	2,470	225	1,005	60
2020	2,756	216	249	105	2,992	239	1,071	70
2025	3,215	219	282	118	3,531	243	1,156	82
2030	3,578	215	315	135	3,972	242	1,265	96
2040	3,938	234	363	165	4,499	265	1,516	128
2050	4,220	246	381	180	4,870	280	1,688	148

\* The number given for retirement beneficiaries does not take into account that the retirement pension can be shared between spouses.

\*\* A beneficiary who receives concurrently a retirement and a survivor pension are counted in each category.

\*\*\* This is the number of deceased contributors giving entitlement to a death benefit during the given year.

**Table 7 Expenditures**  
 (\$ million)

<b>Year</b>	<b>Retirement</b>	<b>Disability</b>	<b>Survivor</b>	<b>Children</b>	<b>Death</b>	<b>Administrative Expenses</b>	<b>Total</b>
<b>2004</b>	16,534	2,939	3,293	475	252	402	23,895
<b>2005</b>	17,350	3,050	3,405	484	262	416	24,967
<b>2006</b>	18,239	3,175	3,514	493	272	431	26,124
<b>2007</b>	19,246	3,315	3,618	503	283	447	27,412
<b>2008</b>	20,367	3,458	3,714	513	294	464	28,810
<b>2009</b>	21,548	3,614	3,819	522	305	483	30,292
<b>2010</b>	22,801	3,786	3,930	532	316	503	31,868
<b>2011</b>	24,172	3,956	4,044	543	327	524	33,567
<b>2012</b>	25,739	4,100	4,157	554	338	548	35,437
<b>2013</b>	27,463	4,261	4,279	567	350	572	37,491
<b>2014</b>	29,289	4,438	4,408	579	361	598	39,674
<b>2015</b>	31,254	4,630	4,546	594	372	625	42,022
<b>2016</b>	33,369	4,834	4,693	610	383	654	44,542
<b>2017</b>	35,616	5,045	4,845	627	395	683	47,212
<b>2018</b>	38,020	5,257	5,004	646	407	713	50,046
<b>2019</b>	40,593	5,464	5,171	666	419	743	53,056
<b>2020</b>	43,342	5,672	5,346	687	432	774	56,253
<b>2021</b>	46,254	5,885	5,534	710	444	805	59,632
<b>2022</b>	49,319	6,094	5,733	735	456	838	63,175
<b>2023</b>	52,554	6,303	5,948	761	470	871	66,907
<b>2024</b>	55,951	6,513	6,177	789	483	906	70,820
<b>2025</b>	59,486	6,716	6,425	819	498	942	74,887
<b>2026</b>	63,123	6,919	6,693	850	513	980	79,078
<b>2027</b>	66,825	7,129	6,981	882	528	1,021	83,366
<b>2028</b>	70,619	7,338	7,292	916	544	1,063	87,772
<b>2029</b>	74,521	7,563	7,626	952	560	1,106	92,328
<b>2030</b>	78,493	7,820	7,984	989	577	1,152	97,015
<b>2031</b>	82,502	8,129	8,366	1,027	593	1,201	101,817
<b>2032</b>	86,528	8,479	8,774	1,066	609	1,252	106,708
<b>2033</b>	90,618	8,849	9,207	1,105	626	1,305	111,710
<b>2034</b>	94,832	9,233	9,664	1,145	642	1,361	116,877
<b>2035</b>	99,212	9,625	10,147	1,184	658	1,420	122,246
<b>2040</b>	123,497	12,004	12,910	1,382	731	1,754	152,278
<b>2045</b>	154,279	14,839	16,174	1,577	787	2,157	189,813
<b>2050</b>	193,987	17,779	19,844	1,787	821	2,639	236,858
<b>2055</b>	243,646	21,184	23,934	2,041	835	3,227	294,867
<b>2060</b>	304,728	25,051	28,703	2,361	842	3,956	365,642
<b>2065</b>	376,514	30,200	34,639	2,756	854	4,873	449,836
<b>2070</b>	462,197	37,201	42,204	3,206	875	6,017	551,701
<b>2075</b>	569,383	45,793	51,575	3,695	897	7,415	678,758

**Table 8 Expenditures - (millions of 2004 constant dollars)<sup>(1)</sup>**

<b>Year</b>	<b>Retirement</b>	<b>Disability</b>	<b>Survivor</b>	<b>Children</b>	<b>Death</b>	<b>Administrative Expenses</b>	<b>Total</b>
<b>2004</b>	16,534	2,938	3,293	475	252	402	23,895
<b>2005</b>	17,024	2,993	3,341	475	257	408	24,497
<b>2006</b>	17,545	3,054	3,381	474	262	415	25,130
<b>2007</b>	18,151	3,125	3,412	474	267	422	25,852
<b>2008</b>	18,831	3,197	3,434	474	272	429	26,638
<b>2009</b>	19,533	3,277	3,462	473	276	438	27,459
<b>2010</b>	20,247	3,362	3,490	472	281	447	28,298
<b>2011</b>	21,005	3,438	3,514	472	284	455	29,170
<b>2012</b>	21,868	3,483	3,532	471	287	466	30,107
<b>2013</b>	22,789	3,536	3,551	470	290	475	31,111
<b>2014</b>	23,715	3,593	3,569	469	292	484	32,124
<b>2015</b>	24,669	3,655	3,588	469	294	493	33,168
<b>2016</b>	25,650	3,716	3,607	468	294	503	34,239
<b>2017</b>	26,658	3,776	3,627	469	296	511	35,337
<b>2018</b>	27,709	3,831	3,647	472	297	520	36,473
<b>2019</b>	28,806	3,877	3,670	473	297	527	37,650
<b>2020</b>	29,948	3,919	3,694	475	299	535	38,870
<b>2021</b>	31,120	3,959	3,723	478	299	542	40,121
<b>2022</b>	32,310	3,992	3,756	482	299	549	41,387
<b>2023</b>	33,524	4,021	3,794	485	300	556	42,680
<b>2024</b>	34,753	4,046	3,837	490	300	563	43,988
<b>2025</b>	35,977	4,062	3,886	495	301	570	45,292
<b>2026</b>	37,173	4,075	3,941	501	302	577	46,569
<b>2027</b>	38,319	4,088	4,004	506	303	585	47,804
<b>2028</b>	39,430	4,097	4,071	511	304	594	49,007
<b>2029</b>	40,514	4,112	4,146	518	304	601	50,195
<b>2030</b>	41,552	4,140	4,226	524	305	610	51,357
<b>2031</b>	42,526	4,190	4,312	529	306	619	52,482
<b>2032</b>	43,429	4,256	4,404	535	306	628	53,557
<b>2033</b>	44,286	4,325	4,500	540	306	638	54,593
<b>2034</b>	45,127	4,394	4,599	544	306	648	55,617
<b>2035</b>	45,970	4,460	4,702	549	305	658	56,643
<b>2040</b>	50,086	4,868	5,236	560	296	711	61,758
<b>2045</b>	54,766	5,268	5,741	560	279	766	67,380
<b>2050</b>	60,273	5,524	6,166	555	255	820	73,594
<b>2055</b>	66,261	5,761	6,509	555	227	878	80,191
<b>2060</b>	72,537	5,963	6,832	562	200	942	87,037
<b>2065</b>	78,447	6,292	7,217	574	178	1,015	93,724
<b>2070</b>	84,289	6,784	7,697	585	160	1,097	100,611
<b>2075</b>	90,886	7,309	8,232	590	143	1,184	108,344

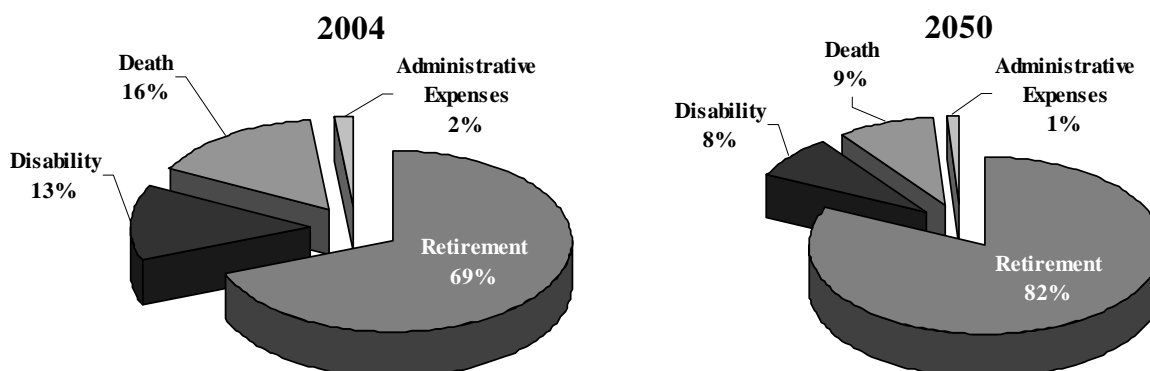
(1) For a given year, the value in 2004 constant dollars is equal to the corresponding value in current dollars divided by the cumulative index of the indexation rates for benefits provided for as of 2004 in the projections.

**Table 9 Expenditures as Percentage of Contributory Earnings**  
 (pay-as-you-go rates)

<b>Year</b>	<b>Retirement</b>	<b>Disability</b>	<b>Survivor</b>	<b>Children</b>	<b>Death</b>	<b>Administrative Expenses</b>	<b>Total</b>
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
<b>2004</b>	5.72	1.02	1.14	0.16	0.09	0.14	8.27
<b>2005</b>	5.81	1.02	1.14	0.16	0.09	0.14	8.36
<b>2006</b>	5.89	1.02	1.13	0.16	0.09	0.14	8.43
<b>2007</b>	5.98	1.03	1.12	0.16	0.09	0.14	8.51
<b>2008</b>	6.07	1.03	1.11	0.15	0.09	0.14	8.59
<b>2009</b>	6.16	1.03	1.09	0.15	0.09	0.14	8.67
<b>2010</b>	6.25	1.04	1.08	0.15	0.09	0.14	8.73
<b>2011</b>	6.34	1.04	1.06	0.14	0.09	0.14	8.81
<b>2012</b>	6.45	1.03	1.04	0.14	0.08	0.14	8.88
<b>2013</b>	6.57	1.02	1.02	0.14	0.08	0.14	8.97
<b>2014</b>	6.68	1.01	1.00	0.13	0.08	0.14	9.04
<b>2015</b>	6.79	1.01	0.99	0.13	0.08	0.14	9.13
<b>2016</b>	6.90	1.00	0.97	0.13	0.08	0.14	9.22
<b>2017</b>	7.02	0.99	0.96	0.12	0.08	0.13	9.31
<b>2018</b>	7.16	0.99	0.94	0.12	0.08	0.13	9.42
<b>2019</b>	7.30	0.98	0.93	0.12	0.08	0.13	9.55
<b>2020</b>	7.46	0.98	0.92	0.12	0.07	0.13	9.68
<b>2021</b>	7.62	0.97	0.91	0.12	0.07	0.13	9.83
<b>2022</b>	7.79	0.96	0.91	0.12	0.07	0.13	9.98
<b>2023</b>	7.96	0.95	0.90	0.12	0.07	0.13	10.13
<b>2024</b>	8.12	0.95	0.90	0.11	0.07	0.13	10.27
<b>2025</b>	8.28	0.93	0.89	0.11	0.07	0.13	10.42
<b>2026</b>	8.42	0.92	0.89	0.11	0.07	0.13	10.55
<b>2027</b>	8.54	0.91	0.89	0.11	0.07	0.13	10.66
<b>2028</b>	8.65	0.90	0.89	0.11	0.07	0.13	10.75
<b>2029</b>	8.75	0.89	0.90	0.11	0.07	0.13	10.84
<b>2030</b>	8.83	0.88	0.90	0.11	0.06	0.13	10.91
<b>2031</b>	8.89	0.88	0.90	0.11	0.06	0.13	10.97
<b>2032</b>	8.92	0.87	0.90	0.11	0.06	0.13	11.00
<b>2033</b>	8.95	0.87	0.91	0.11	0.06	0.13	11.03
<b>2034</b>	8.96	0.87	0.91	0.11	0.06	0.13	11.04
<b>2035</b>	8.97	0.87	0.92	0.11	0.06	0.13	11.06
<b>2040</b>	8.97	0.87	0.94	0.10	0.05	0.13	11.07
<b>2045</b>	9.05	0.87	0.95	0.09	0.05	0.13	11.14
<b>2050</b>	9.25	0.85	0.95	0.09	0.04	0.13	11.29
<b>2055</b>	9.45	0.82	0.93	0.08	0.03	0.13	11.44
<b>2060</b>	9.60	0.79	0.90	0.07	0.03	0.12	11.52
<b>2065</b>	9.60	0.77	0.88	0.07	0.02	0.12	11.47
<b>2070</b>	9.52	0.77	0.87	0.07	0.02	0.12	11.36
<b>2075</b>	9.49	0.76	0.86	0.06	0.02	0.12	11.32

It is interesting to compare the relative change in the distribution of expenditures by type of event over the projection period. Chart 4 presents the distribution of expenditures for 2004 and 2050. The increasing proportion of retirement benefits, which rises from 69% in 2004 to 82% in 2050, clearly shows the impact of the aging population on the benefits paid by the Canada Pension Plan.

**Chart 4 Distribution of Expenditures by Type of Event**



## D. Asset Projections

### 1. Asset Projections at Market Value

Historically, CPP assets have been presented at cost value because they have been traditionally limited to short-term investments for the Account component and 20-year bonds for the Fund component (i.e. loans to provinces). Since the creation of the CPP Investment Board in 1998, excess cash flows are invested in the capital markets. Those assets, as is the case for private pension plans, are usually valued at market.

The new investment policies make it more realistic to use a market value approach in projecting assets, especially as the proportion of assets under the CPP Investment Board is expected to grow to 100% by the end of 2007. For this purpose and for consistency with the methodology used in large private pension plans and in the Québec Pension Plan actuarial report, the financial projections of assets are now valued at market. The market value of assets is \$67,614 million as at 31 December 2003. Note that this is higher than the \$64,028 million presented in the historical results of Table 10 for year 2003. This is because the Fund component for year 2003 is now valued on a market value basis as opposed to a cost accrual basis.

### 2. Projected Financial Status

Table 10 presents historical results while Tables 11 and 12 show, respectively, in current dollars and in 2004 constant dollars, the projected financial status of the CPP, using the legislated contribution rate of 9.9% for years 2004 and thereafter. The projection of assets using the steady-state contribution rate of 9.8% for years 2007 and thereafter is discussed in subsection 3 and the detailed financial projections are presented in Appendix F.

**Table 10 Historical Results**  
(\$ million)

Year	Paygo Rate*	Contribution Rate	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.	Yield	Asset/Expenditure Ratio
	(%)	(%)						(%)	
1966	0.05	3.6	531	8	523	5	525	0.7	52.47
1967	0.06	3.6	623	10	614	37	1,175	4.3	48.98
1968	0.14	3.6	686	24	662	79	1,916	5.2	35.49
1969	0.29	3.6	737	54	683	128	2,727	5.6	28.12
1970	0.49	3.6	773	97	676	193	3,596	6.2	24.14
1971	0.69	3.6	816	149	666	260	4,523	6.6	21.33
1972	0.90	3.6	869	212	657	333	5,513	6.8	19.83
1973	1.08	3.6	939	278	661	406	6,578	6.9	16.78
1974	1.24	3.6	1,203	392	812	497	7,887	7.1	14.06
1975	1.50	3.6	1,426	561	865	608	9,359	7.3	11.47
1976	1.90	3.6	1,630	816	815	746	10,920	7.6	10.48
1977	2.17	3.6	1,828	1,042	786	889	12,596	7.8	9.72
1978	2.38	3.6	2,022	1,296	727	1,043	14,365	8.0	9.03
1979	2.54	3.6	2,317	1,590	727	1,235	16,328	8.3	8.31
1980	2.79	3.6	2,604	1,965	638	1,467	18,433	8.8	7.64
1981	2.94	3.6	3,008	2,413	595	1,785	20,812	9.5	7.03
1982	3.30	3.6	3,665	2,958	707	2,160	23,679	10.1	6.58
1983	3.70	3.6	3,474	3,598	(124)	2,494	26,049	10.5	6.22
1984	3.87	3.6	4,118	4,185	(67)	2,829	28,811	10.8	5.97
1985	4.02	3.6	4,032	4,826	(795)	3,114	31,130	10.9	5.66
1986	4.16	3.6	4,721	5,503	(782)	3,395	33,743	11.0	4.73
1987	5.08	3.8	5,393	7,130	(1,736)	3,653	35,660	11.0	4.31
1988	5.49	4.0	6,113	8,272	(2,159)	3,885	37,387	11.2	3.98
1989	5.76	4.2	6,694	9,391	(2,698)	4,162	38,852	11.5	3.72
1990	6.08	4.4	7,889	10,438	(2,549)	4,387	40,689	11.6	3.53
1991	6.54	4.6	8,396	11,518	(3,122)	4,476	42,043	11.3	3.22
1992	7.23	4.8	8,883	13,076	(4,193)	4,498	42,347	11.1	2.97
1993	7.72	5.0	9,166	14,273	(5,106)	4,479	41,720	11.1	2.72
1994	8.02	5.2	9,585	15,362	(5,778)	4,404	40,346	11.2	2.52
1995	8.09	5.4	10,911	15,986	(5,075)	4,411	39,683	11.5	2.37
1996	8.28	5.6	10,757	16,723	(5,966)	4,178	37,894	11.2	2.15
1997	8.30	6.0	12,165	17,570	(5,405)	3,971	36,460	11.1	1.97
1998	8.19	6.4	14,473	18,338	(3,865)	3,938	36,535	11.2	1.94
1999	8.05	7.0	16,052	18,877	(2,825)	3,845	37,554	10.7	1.91
2000	8.01	7.8	19,977	19,683	294	3,747	41,595	9.7	2.02
2001**	7.85	8.6	22,469	20,515	1,954	2,628	48,272	5.7	2.23
2002**	8.16	9.4	24,955	21,666	3,289	227	51,788	0.5	2.28
2003**	8.19	9.9	27,454	22,716	4,738	7,502	64,028	13.6	2.68

\* The pay-as-you-go rates have been calculated using the historical contributory earnings while the contributions are based on an estimate made by the Department of Finance.

\*\* Results for years 1966 to 2000 are on a cash basis, while results for years 2001 to 2003 are presented on a cost accrual basis with CPPIB assets valued at market. If assets were shown at market value at the end of 2003, total assets would be \$67,614 million instead of \$64,028 million.

**Table 11 Financial Status**  
(\$ million)

Year	Paygo Rate	Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.*	Yield	Asset/Expenditure Ratio
	(%)	(%)							(%)	
2004	8.27	9.9	288,970	28,608	23,895	4,713	4,530	76,857	6.43	3.08
2005	8.36	9.9	298,643	29,566	24,967	4,599	5,565	87,021	7.00	3.33
2006	8.43	9.9	309,772	30,667	26,124	4,543	6,294	97,858	7.02	3.57
2007	8.51	9.9	322,095	31,887	27,412	4,475	6,865	109,198	6.83	3.79
2008	8.59	9.9	335,376	33,202	28,810	4,392	7,460	121,050	6.67	4.00
2009	8.67	9.9	349,556	34,606	30,292	4,314	8,188	133,553	6.62	4.19
2010	8.73	9.9	364,926	36,128	31,868	4,260	8,982	146,795	6.60	4.37
2011	8.81	9.9	381,122	37,731	33,567	4,164	9,841	160,800	6.59	4.54
2012	8.88	9.9	399,171	39,518	35,437	4,081	10,839	175,720	6.64	4.69
2013	8.97	9.9	418,003	41,382	37,491	3,891	11,992	191,603	6.74	4.83
2014	9.04	9.9	438,749	43,436	39,674	3,762	13,258	208,623	6.84	4.96
2015	9.13	9.9	460,396	45,579	42,022	3,557	14,635	226,815	6.95	5.09
2016	9.22	9.9	483,344	47,851	44,542	3,309	15,891	246,015	6.95	5.21
2017	9.31	9.9	507,310	50,224	47,212	3,012	17,203	266,229	6.94	5.32
2018	9.42	9.9	531,212	52,590	50,046	2,544	18,585	287,359	6.94	5.42
2019	9.55	9.9	555,717	55,016	53,056	1,960	20,016	309,335	6.94	5.50
2020	9.68	9.9	581,181	57,537	56,253	1,284	21,497	332,116	6.93	5.57
2021	9.83	9.9	606,726	60,066	59,632	434	23,036	355,585	6.93	5.63
2022	9.98	9.9	633,199	62,687	63,175	(488)	24,526	379,624	6.90	5.67
2023	10.13	9.9	660,470	65,387	66,907	(1,520)	26,055	404,158	6.88	5.71
2024	10.27	9.9	689,301	68,241	70,820	(2,579)	27,598	429,177	6.86	5.73
2025	10.42	9.9	718,640	71,145	74,887	(3,742)	29,177	454,613	6.83	5.75
2026	10.55	9.9	749,328	74,183	79,078	(4,895)	30,771	480,489	6.81	5.76
2027	10.66	9.9	782,108	77,429	83,366	(5,937)	32,499	507,051	6.81	5.78
2028	10.75	9.9	816,109	80,795	87,772	(6,977)	34,274	534,348	6.82	5.79
2029	10.84	9.9	852,033	84,351	92,328	(7,977)	36,079	562,450	6.81	5.80
2030	10.91	9.9	888,999	88,011	97,015	(9,004)	37,958	591,404	6.81	5.81
2031	10.97	9.9	928,021	91,874	101,817	(9,943)	39,898	621,359	6.81	5.82
2032	11.00	9.9	969,672	95,998	106,708	(10,710)	41,912	652,560	6.81	5.84
2033	11.03	9.9	1,012,946	100,282	111,710	(11,428)	44,010	685,143	6.81	5.86
2034	11.04	9.9	1,058,322	104,774	116,877	(12,103)	46,204	719,243	6.81	5.88
2035	11.06	9.9	1,105,734	109,468	122,246	(12,778)	48,500	754,965	6.81	5.91
2040	11.07	9.9	1,376,157	136,240	152,278	(16,038)	61,823	962,443	6.81	6.05
2045	11.14	9.9	1,704,048	168,701	189,813	(21,112)	78,825	1,226,867	6.81	6.18
2050	11.29	9.9	2,097,524	207,655	236,858	(29,203)	99,894	1,553,781	6.81	6.28
2055	11.44	9.9	2,578,617	255,283	294,867	(39,584)	125,573	1,952,041	6.81	6.34
2060	11.52	9.9	3,174,429	314,268	365,642	(51,374)	156,849	2,437,440	6.81	6.39
2065	11.47	9.9	3,923,366	388,413	449,836	(61,423)	196,026	3,047,388	6.81	6.50
2070	11.36	9.9	4,856,127	480,757	551,701	(70,944)	246,821	3,839,635	6.81	6.68
2075	11.32	9.9	5,997,855	593,788	678,758	(84,970)	313,035	4,871,724	6.81	6.88

\* All asset components are valued at market.



**Table 12 Financial Status - (millions of 2004 constant dollars)**

<b>Year</b>	<b>Paygo Rate</b>	<b>Contribution Rate</b>	<b>Contributory Earnings</b>	<b>Contributions</b>	<b>Expenditures</b>	<b>Net Cash Flow</b>	<b>Investment Earnings</b>	<b>Assets at 31 Dec.*</b>
	(%)	(%)						
<b>2004</b>	8.27	9.9	288,970	28,608	23,895	4,713	4,530	76,857
<b>2005</b>	8.36	9.9	293,027	29,010	24,497	4,512	5,461	85,384
<b>2006</b>	8.43	9.9	297,987	29,501	25,130	4,371	6,054	94,135
<b>2007</b>	8.51	9.9	303,766	30,073	25,852	4,221	6,474	102,984
<b>2008</b>	8.59	9.9	310,089	30,699	26,638	4,061	6,898	111,923
<b>2009</b>	8.67	9.9	316,863	31,369	27,459	3,911	7,423	121,062
<b>2010</b>	8.73	9.9	324,043	32,080	28,298	3,782	7,976	130,349
<b>2011</b>	8.81	9.9	331,193	32,788	29,170	3,619	8,552	139,734
<b>2012</b>	8.88	9.9	339,133	33,574	30,107	3,467	9,209	149,290
<b>2013</b>	8.97	9.9	346,864	34,340	31,111	3,229	9,951	158,994
<b>2014</b>	9.04	9.9	355,256	35,170	32,124	3,046	10,735	168,922
<b>2015</b>	9.13	9.9	363,395	35,976	33,168	2,808	11,552	179,027
<b>2016</b>	9.22	9.9	371,537	36,782	34,239	2,544	12,215	189,107
<b>2017</b>	9.31	9.9	379,707	37,591	35,337	2,254	12,876	199,265
<b>2018</b>	9.42	9.9	387,144	38,327	36,473	1,854	13,545	209,425
<b>2019</b>	9.55	9.9	394,356	39,041	37,650	1,391	14,204	219,514
<b>2020</b>	9.68	9.9	401,583	39,757	38,870	887	14,854	229,485
<b>2021</b>	9.83	9.9	408,213	40,413	40,121	292	15,499	239,242
<b>2022</b>	9.98	9.9	414,824	41,068	41,387	(320)	16,068	248,700
<b>2023</b>	10.13	9.9	421,314	41,710	42,680	(970)	16,620	257,813
<b>2024</b>	10.27	9.9	428,145	42,386	43,988	(1,602)	17,142	266,575
<b>2025</b>	10.42	9.9	434,634	43,029	45,292	(2,263)	17,646	274,950
<b>2026</b>	10.55	9.9	441,279	43,687	46,569	(2,882)	18,121	282,960
<b>2027</b>	10.66	9.9	448,475	44,399	47,804	(3,405)	18,635	290,752
<b>2028</b>	10.75	9.9	455,668	45,111	49,007	(3,896)	19,137	298,349
<b>2029</b>	10.84	9.9	463,219	45,859	50,195	(4,337)	19,615	305,784
<b>2030</b>	10.91	9.9	470,610	46,590	51,357	(4,767)	20,094	313,072
<b>2031</b>	10.97	9.9	478,352	47,357	52,482	(5,125)	20,566	320,282
<b>2032</b>	11.00	9.9	486,680	48,181	53,557	(5,376)	21,036	327,521
<b>2033</b>	11.03	9.9	495,034	49,008	54,593	(5,585)	21,508	334,834
<b>2034</b>	11.04	9.9	503,612	49,858	55,617	(5,759)	21,986	342,258
<b>2035</b>	11.06	9.9	512,340	50,722	56,643	(5,921)	22,473	349,812
<b>2040</b>	11.07	9.9	558,115	55,253	61,758	(6,505)	25,073	390,329
<b>2045</b>	11.14	9.9	604,903	59,885	67,380	(7,494)	27,981	435,513
<b>2050</b>	11.29	9.9	651,716	64,520	73,594	(9,074)	31,038	482,771
<b>2055</b>	11.44	9.9	701,272	69,426	80,191	(10,765)	34,150	530,870
<b>2060</b>	11.52	9.9	755,636	74,808	87,037	(12,229)	37,336	580,205
<b>2065</b>	11.47	9.9	817,436	80,926	93,724	(12,797)	40,842	634,926
<b>2070</b>	11.36	9.9	885,591	87,673	100,611	(12,938)	45,012	700,218
<b>2075</b>	11.32	9.9	957,386	94,781	108,344	(13,563)	49,967	777,631

\* All asset components are valued at market.

Table 13 presents the net cash flow, investment earnings and assets by component, namely the Account, the Fund (federal and provincial bonds) and the assets under the management of the CPP Investment Board.

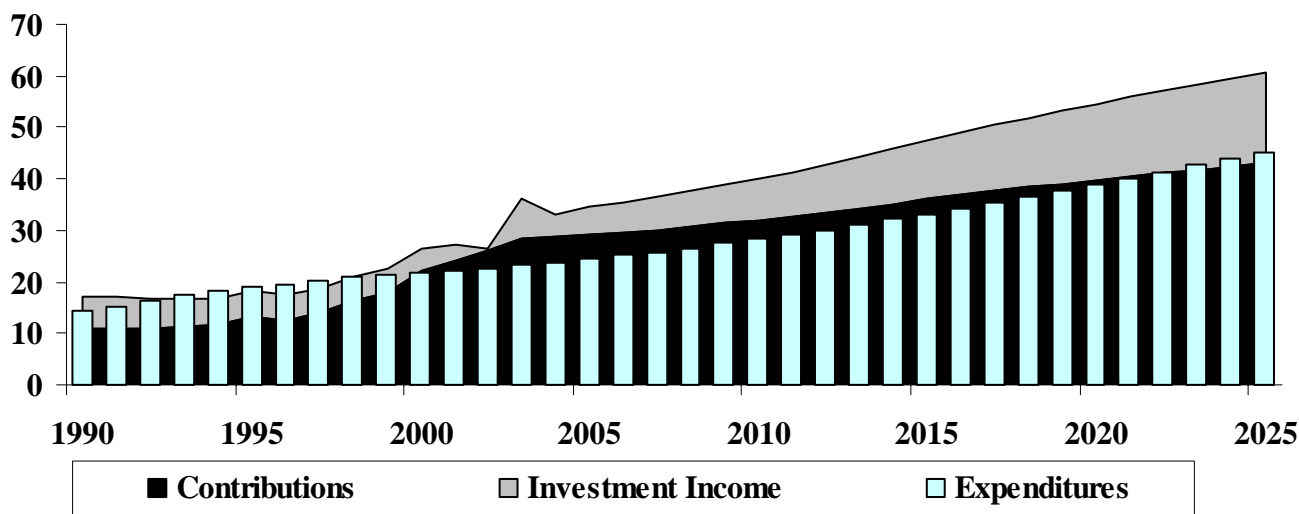
Assets increase significantly over the next 17 years, from \$77 billion in 2004 to \$356 billion in 2021. Contributions and investment earnings are projected to be 40% higher than expenditures over that period. Thereafter, revenues continue to be higher than expenditures but to a lesser extent. This causes the assets to grow at a much slower pace. The assets reach a level of \$1,554 billion by 2050. Table 14 shows in more detail the sources of the cash required to cover the expenditures.

From Table 14, several conclusions can be drawn.

- The assets grow continuously over the projection period. During the period 2004 to 2021, contributions are more than sufficient to cover expenditures.
- From 2022 onward, some of the investment earnings are required to fund net cash outflows. In 2050, 29% of investment earnings are required to pay for benefits.
- Investment earnings, which represent 14% of revenues (i.e. contributions and investment earnings) in 2004, will represent 27% in 2020. In 2050, investment earnings represent 32% of revenues. This clearly illustrates the importance of investment earnings as a source of revenues to the Plan.

Chart 5 shows the distribution of cash flows by source for the period 1990 to 2025.

**Chart 5 Distribution of Cash Flows by Source**  
 (billions of 2004 constant dollars)



**Table 13 Assets by Component - Using 9.9% Contribution Rate**  
(\$ billion)

Year	Net Cash Flow	Investment Earnings				Assets*			
		Account	Fund	CPPIB	Total	Account	Fund	CPPIB	Total
2004	4.7	0.1	2.5	1.9	4.5	4.1	22.0	50.8	76.9
2005	4.6	0.1	1.8	3.7	5.6	0.0	11.7	75.3	87.0
2006	4.5	0.0	0.9	5.4	6.3	0.0	2.6	95.2	97.9
2007	4.5	0.0	0.2	6.7	6.9	0.0	0.0	109.2	109.2
2008	4.4	0.0	0.0	7.5	7.5	0.0	0.0	121.1	121.1
2009	4.3	0.0	0.0	8.2	8.2	0.0	0.0	133.6	133.6
2010	4.3	0.0	0.0	9.0	9.0	0.0	0.0	146.8	146.8
2011	4.2	0.0	0.0	9.8	9.8	0.0	0.0	160.8	160.8
2012	4.1	0.0	0.0	10.8	10.8	0.0	0.0	175.7	175.7
2013	3.9	0.0	0.0	12.0	12.0	0.0	0.0	191.6	191.6
2014	3.8	0.0	0.0	13.3	13.3	0.0	0.0	208.6	208.6
2015	3.6	0.0	0.0	14.6	14.6	0.0	0.0	226.8	226.8
2016	3.3	0.0	0.0	15.9	15.9	0.0	0.0	246.0	246.0
2017	3.0	0.0	0.0	17.2	17.2	0.0	0.0	266.2	266.2
2018	2.5	0.0	0.0	18.6	18.6	0.0	0.0	287.4	287.4
2019	2.0	0.0	0.0	20.0	20.0	0.0	0.0	309.3	309.3
2020	1.3	0.0	0.0	21.5	21.5	0.0	0.0	332.1	332.1
2021	0.4	0.0	0.0	23.0	23.0	0.0	0.0	355.6	355.6
2022	(0.5)	0.0	0.0	24.5	24.5	0.0	0.0	379.6	379.6
2023	(1.5)	0.0	0.0	26.1	26.1	0.0	0.0	404.2	404.2
2024	(2.6)	0.0	0.0	27.6	27.6	0.0	0.0	429.2	429.2
2025	(3.7)	0.0	0.0	29.2	29.2	0.0	0.0	454.6	454.6
2026	(4.9)	0.0	0.0	30.8	30.8	0.0	0.0	480.5	480.5
2027	(5.9)	0.0	0.0	32.5	32.5	0.0	0.0	507.1	507.1
2028	(7.0)	0.0	0.0	34.3	34.3	0.0	0.0	534.3	534.3
2029	(8.0)	0.0	0.0	36.1	36.1	0.0	0.0	562.5	562.5
2030	(9.0)	0.0	0.0	38.0	38.0	0.0	0.0	591.4	591.4
2031	(9.9)	0.0	0.0	39.9	39.9	0.0	0.0	621.4	621.4
2032	(10.7)	0.0	0.0	41.9	41.9	0.0	0.0	652.6	652.6
2033	(11.4)	0.0	0.0	44.0	44.0	0.0	0.0	685.1	685.1
2034	(12.1)	0.0	0.0	46.2	46.2	0.0	0.0	719.2	719.2
2035	(12.8)	0.0	0.0	48.5	48.5	0.0	0.0	755.0	755.0
2040	(16.0)	0.0	0.0	61.8	61.8	0.0	0.0	962.4	962.4
2045	(21.1)	0.0	0.0	78.8	78.8	0.0	0.0	1,226.9	1,226.9
2050	(29.2)	0.0	0.0	99.9	99.9	0.0	0.0	1,553.8	1,553.8
2055	(39.6)	0.0	0.0	125.6	125.6	0.0	0.0	1,952.0	1,952.0
2060	(51.4)	0.0	0.0	156.8	156.8	0.0	0.0	2,437.4	2,437.4
2065	(61.4)	0.0	0.0	196.0	196.0	0.0	0.0	3,047.4	3,047.4
2070	(70.9)	0.0	0.0	246.8	246.8	0.0	0.0	3,839.6	3,839.6
2075	(85.0)	0.0	0.0	313.0	313.0	0.0	0.0	4,871.7	4,871.7

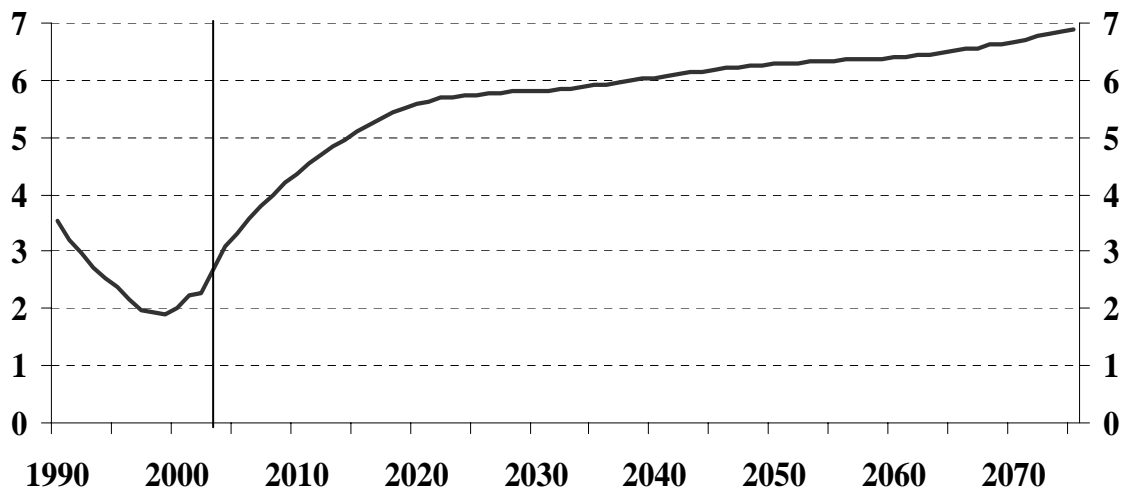
\* All asset components are valued at market.

**Table 14 Sources of Income and Funding of Expenditures**  
(\$ billion)

<b>Year</b>	<b>Expenditures</b>	<b>Contributions</b>	<b>Shortfall</b>	<b>Investment Earnings</b>	<b>Shortfall as % of Investment Earnings</b>	<b>Total Assets</b>
<b>2004</b>	23.9	28.6	0.0	4.5	0.0	76.9
<b>2005</b>	25.0	29.6	0.0	5.6	0.0	87.0
<b>2006</b>	26.1	30.7	0.0	6.3	0.0	97.9
<b>2007</b>	27.4	31.9	0.0	6.9	0.0	109.2
<b>2008</b>	28.8	33.2	0.0	7.5	0.0	121.1
<b>2009</b>	30.3	34.6	0.0	8.2	0.0	133.6
<b>2010</b>	31.9	36.1	0.0	9.0	0.0	146.8
<b>2011</b>	33.6	37.7	0.0	9.8	0.0	160.8
<b>2012</b>	35.4	39.5	0.0	10.8	0.0	175.7
<b>2013</b>	37.5	41.4	0.0	12.0	0.0	191.6
<b>2014</b>	39.7	43.4	0.0	13.3	0.0	208.6
<b>2015</b>	42.0	45.6	0.0	14.6	0.0	226.8
<b>2016</b>	44.5	47.9	0.0	15.9	0.0	246.0
<b>2017</b>	47.2	50.2	0.0	17.2	0.0	266.2
<b>2018</b>	50.0	52.6	0.0	18.6	0.0	287.4
<b>2019</b>	53.1	55.0	0.0	20.0	0.0	309.3
<b>2020</b>	56.3	57.5	0.0	21.5	0.0	332.1
<b>2021</b>	59.6	60.1	0.0	23.0	0.0	355.6
<b>2022</b>	63.2	62.7	0.5	24.5	2.0	379.6
<b>2023</b>	66.9	65.4	1.5	26.1	5.8	404.2
<b>2024</b>	70.8	68.2	2.6	27.6	9.3	429.2
<b>2025</b>	74.9	71.1	3.7	29.2	12.8	454.6
<b>2026</b>	79.1	74.2	4.9	30.8	15.9	480.5
<b>2027</b>	83.4	77.4	5.9	32.5	18.3	507.1
<b>2028</b>	87.8	80.8	7.0	34.3	20.4	534.3
<b>2029</b>	92.3	84.4	8.0	36.1	22.1	562.5
<b>2030</b>	97.0	88.0	9.0	38.0	23.7	591.4
<b>2031</b>	101.8	91.9	9.9	39.9	24.9	621.4
<b>2032</b>	106.7	96.0	10.7	41.9	25.6	652.6
<b>2033</b>	111.7	100.3	11.4	44.0	26.0	685.1
<b>2034</b>	116.9	104.8	12.1	46.2	26.2	719.2
<b>2035</b>	122.2	109.5	12.8	48.5	26.3	755.0
<b>2040</b>	152.3	136.2	16.0	61.8	25.9	962.4
<b>2045</b>	189.8	168.7	21.1	78.8	26.8	1,226.9
<b>2050</b>	236.9	207.7	29.2	99.9	29.2	1,553.8
<b>2055</b>	294.9	255.3	39.6	125.6	31.5	1,952.0
<b>2060</b>	365.6	314.3	51.4	156.8	32.8	2,437.4
<b>2065</b>	449.8	388.4	61.4	196.0	31.3	3,047.4
<b>2070</b>	551.7	480.8	70.9	246.8	28.7	3,839.6
<b>2075</b>	678.8	593.8	85.0	313.0	27.1	4,871.7

An important measure of the Plan's funding status is defined by the ratio of assets at the end of one year to the expenditures of the next. As can be seen in Chart 6, this ratio is projected to increase over the next two decades, reaching 5.6 by 2020. Thereafter it rises slowly to a value of 6.3 in 2050.

**Chart 6 Asset/Expenditure Ratio**  
 (9.9% contribution rate for 2004+)



The slowdown in the growth rate of the ratio from 2015 to 2035 results from the retirement of the baby boom generation, which increases the cash outflows of the Plan. The existence of a large pool of assets enables the Plan to absorb the increased outflow and to maintain the contribution rate at 9.9% without impairing the financial soundness of the Plan.

### 3. Steady-State Contribution Rate

Section 115 (1.1) (c) of the *Canada Pension Plan* describes the financing objective of having a contribution rate in 2007 and thereafter that is no lower than the lowest rate that will result in the ratio of the assets to the following year's expenditures remaining generally constant over the foreseeable future. The lowest contribution rate that will meet this objective is referred to as the steady-state contribution rate in this report.

The steady-state contribution rate is defined as the lowest level contribution rate applicable after the end of the review period, rounded to the nearest 0.1% that results in the asset/expenditure ratio being the same in the 10<sup>th</sup> and 60<sup>th</sup> year following the end of the review period. For this report, the end of the review period is 2006. Therefore, the steady-state contribution rate is applicable for years 2007 and thereafter and the relevant years for the determination of the steady-state contribution rate are 2016 and 2066.

The resulting steady-state contribution rate for this report was determined to be 9.8% for years 2007 and thereafter and is the same as for the previous report. Table 15 presents the elements of change in the steady-state contribution rate from the previous report.

**Table 15 Steady-State Contribution Rate**

	<b>Steady-State Contribution Rate (%)</b>
<b>18<sup>th</sup> Report (Rounded)</b>	<b>9.8</b>
<b>18<sup>th</sup> Report (Unrounded)</b>	<b>9.795</b>
<b>Amendments</b>	
-19 <sup>th</sup> Report (Bill C-3)	<b>(0.033)</b>
-20 <sup>th</sup> Report (Part 4 of Bill C-30)	<b>(0.012)</b>
<b>Experience (2001 to 2003)</b>	<b>(0.020)</b>
<b>Changes in Methods</b>	<b>0.034</b>
<b>Changes in Demographic Assumptions</b>	<b>0.036</b>
<b>Changes in Economic Assumptions</b>	<b>(0.005)</b>
<b>Changes in Investment Assumptions</b>	<b>0.028</b>
<b>Changes in Benefit Assumptions</b>	<b>(0.053)</b>
<b>21<sup>st</sup> Report (Unrounded)</b>	<b>9.770</b>
<b>21<sup>st</sup> Report (Rounded)</b>	<b>9.8</b>

The steady-state contribution rate required under subsection 115(1.1) (c) of the *Canada Pension Plan* is referred to by the default provisions in subsections 113.1(11.01) to 113.1(11.15). The default provisions may result in adjustments being made to the contribution rate and, perhaps, benefits in payment if the federal and provincial governments reach no agreement in response to the actuarial determination of a steady-state contribution rate. In respect of the current triennial review, the steady-state contribution rate is less than 9.9% and so the default provisions do not apply. Therefore, in the absence of specific action by the federal and provincial governments, the legislated contribution rate will remain at 9.9% for years 2004 and thereafter.

Table 16 compares the projected asset/expenditure ratio if either the legislated contribution rate of 9.9% or the 9.8% steady-state contribution rate is used. A detailed financial projection based on the steady-state contribution rate of 9.8% in 2007 and thereafter is shown in Appendix F of this report.

**Table 16 Asset/Expenditure Ratio**

<b>Contribution Rate</b>	<b>2004</b>	<b>2016</b>	<b>2025</b>	<b>2050</b>	<b>2066</b>	<b>2075</b>
<b>9.9% (Statutory)</b>	3.08	5.21	5.75	6.28	6.53	6.88
<b>9.8% (Steady-State)</b>	3.08	5.09*	5.53	5.62	5.40*	5.38

\* These numbers are the same if the unrounded steady-state rate of 9.770% is used.

The steady-state contribution rate will be recalculated in connection with the next triennial actuarial report, to be prepared as at 31 December 2006. It may also be recalculated at any other date to reflect the cost impact of any proposed amendments to the Plan.

## V. Sensitivity Analysis

### A. Introduction

The future income and outgo of the Canada Pension Plan depend on many economic and demographic factors, including the labour force, average earnings, inflation, fertility, mortality, migration, retirement patterns and disability rates. The income will depend on how these factors affect the size and composition of the working-age population and the level and distribution of earnings. Similarly, the outgo will depend on how these factors affect the size and composition of the beneficiary population and the general level of benefits.

The projected long-term financial status of the Plan is based on best-estimate assumptions; the objective of this subsection is to present alternative scenarios. The alternatives presented illustrate the sensitivity of the long-term projected financial position of the Plan to changes in the future economic and demographic outlook. The scenarios in subsections B and C portray a generally younger and older population.

The scenarios reflect the possible outlooks on each of the principal assumptions, taking into account the interrelationships between these assumptions. For example, one could assume a much lower fertility rate but might also assume that immigration policies would change to partly compensate for the reduction in population growth that would otherwise occur. As another example, one may suggest longer life expectancy at age 65 combined with an increased average age at retirement. The choice of assumptions will always remain subjective to a certain degree and one could always argue that the range of possible projected outcomes presented herein is not realistic. However, we must keep in mind that these alternative scenarios are only presented to provide a reasonable range of possible future outcomes for the costs of the Plan.

Because the projected financial status of the Plan is very sensitive to the assumed demographic outlook, the alternative scenarios presented in subsections B and C are demographically based. First we look at the younger population alternative where the ratio of retirees to workers would be lower than under the best-estimate assumption. The second scenario has a ratio of retirees to workers that is higher than the best-estimate and can be referred to as the older population scenario. The economic outlook under both demographic alternatives has been adjusted to reflect the anticipated effects of a modified demographic environment on the main economic variables that affect the Plan. Results are shown in subsection D.

In addition to the younger and older population scenarios, the impact of financial markets volatility on the financial status of the Plan is examined in subsection E. Sensitivity tests on an individual assumption basis were also performed for the main assumptions and are presented in Appendix C of this report.

### B. Younger Population Scenario

Under the younger population scenario, it is assumed that the total fertility rate is 1.80 per woman for Canada and 1.75 for Québec. These are 0.20 higher than the best-estimate assumption. These rates could be attained if the current increasing trend in fertility for

those aged 30 and over is extrapolated further in time than has been done under the best-estimate scenario. These levels of fertility remain well under the national population replacement rate of 2.1 and correspond to the 1970s experience.

Under a scenario of a younger population, net migration to Canada is assumed to reach a level of 0.64% of the population by the year 2005. This is an 18.5% increase from the best-estimate and corresponds to the level of migration observed during the mid-1990s. Mortality is assumed to improve at half the rate assumed in the best-estimate scenario. This reflects to a certain degree the slowdown in mortality improvements observed over the last few years. This results in life expectancy at age 65 being reduced by about one year for both males and females.

The combination of these younger population assumptions results in a dependency ratio of those aged 65 and over to the working-age population (20-64) of about 0.40 (or 2.5 workers per retiree) in 2050. This is 7% lower than under the best-estimate scenario where the ratio reaches a level of 0.43 (or 2.3 workers per retiree) in 2050.

It was assumed that under a better demographic outlook the anticipated labour shortage would be less severe. As a result, it was assumed that the ultimate unemployment rate would be slightly higher than under the best-estimate, i.e. 7.0% as opposed to 6.5%, and that the labour force participation rates would be somewhat lower, especially for ages 55 and over. With a larger labour force there would be less pressure to work to a later age, and both employers and unions would more easily manage early retirement.

Furthermore, due to the reduced risk of an anticipated labour shortage, there would be less pressure on average wages as the demand for workers would be met more easily. For this reason, the assumed ultimate real wage increase was reduced from 1.2% to 1.0%. Prices are assumed to be lower under such a scenario as the average consumer demand for goods can be met with more ease through a larger labour force. The ultimate price increase assumption was set at 2.5% as opposed to 2.7%.

Disability incidence rates were reduced under this scenario as slightly better economic conditions prevail. Disability incidence rates were set at 3.00 per thousand for males and 3.25 per thousand for females.

Under this scenario, the ultimate real increase in total employment earnings is 1.7% as opposed to 1.5% under the best-estimate. The lower real-wage increases under the younger population scenario are more than offset by the higher population increases, so there is a larger real increase in total employment earnings.

Finally, capital markets are assumed to perform better under such conditions as individuals are generally better off economically and are willing to take on additional risk. This would on average yield a higher return on their investments. For this purpose, the real rate of return on assets is increased by 0.4% to 4.5%.



### **C. Older Population Scenario**

Under the older population scenario, it is assumed that the total fertility rate is 1.40 per woman for Canada and 1.35 for Québec. These are 0.20 lower than the best-estimate assumption. These rates are lower than current observed total fertility levels and could be attained if fewer women have multiple births over their lifetime.

Under a scenario of an older population, net migration to Canada is assumed to fall to a level of 0.44% of the population by the year 2005. This is 18.5% lower than the best-estimate and corresponds to the level of migration observed during the recession of the early 1980s. Mortality is assumed to improve at a rate that is 50% higher than assumed in the best-estimate scenario. This results in life expectancy at age 65 being increased by about one year for both males and females.

The combination of these older population assumptions results in a dependency ratio of the 65 and over to the working-age population (20-64) of about 0.51 (or 1.96 workers per retiree) in 2050. This is 19% higher than under the best-estimate scenario where the dependency ratio reaches a level of 0.43 (or 2.3 workers per retiree) in 2050.

It was assumed that with a poorer demographic outlook the anticipated labour shortage would be more severe. For this purpose, it was assumed that the ultimate unemployment rate would be slightly lower than under the best-estimate, i.e. 6.0% as opposed to 6.5%, and that the labour force participation rates would be somewhat higher, especially for ages 55 and over. With a smaller labour force there would be more pressure to work to a later age and early retirement would be more difficult to manage for both employers and unions.

Furthermore, due to the increased risk of a labour shortage, there would be upward pressure on average wages as the demand for workers would be met with greater difficulty. For this reason, the assumed ultimate real wage increase was increased from 1.2% to 1.4%. Prices are assumed to be higher under such an environment as a reduced labour force cannot meet the consumer demand for goods as economically. The ultimate price increase assumption was set at 3.0% as opposed to 2.7%.

Disability incidence rates were increased under this alternative as slightly worse economic conditions prevail. Disability incidence rates were set at 3.50 per thousand for males and 3.75 per thousand for females.

Under this scenario, the ultimate real increase in total employment earnings is 1.2% as opposed to 1.5% under the best-estimate. The higher real-wage increases are more than offset by the lower population increases, so there is a smaller real increase in total employment earnings.

Finally, capital markets are assumed to perform worse under such conditions as individuals are generally worse off economically and are less willing to take on risk. This would on average yield a lower return on their investments. For this purpose, the real rate of return on assets is decreased by 0.4% to 3.7%.

## D. Results

Table 17 presents a summary of the assumptions used in the sensitivity analysis. Tables 18 and 19 present the financial development under both the younger and older population scenarios, respectively. Both projections assume the currently scheduled contribution rate of 9.9%. The steady-state contribution rates are 9.3% and 10.3% for the younger and older population scenarios, respectively. Chart 7 shows the evolution of the asset/expenditure ratio under the younger, best-estimate and older population scenarios with the legislated contribution rate of 9.9%, while Chart 8 shows the asset/expenditure ratio if the resulting steady-state rates are used.

**Table 17 Summary of Sensitivity Test Assumptions**

<b>Canada</b>	<b>Younger Population</b>		<b>Best-Estimate</b>		<b>Older Population</b>	
Total fertility rate	1.80		1.60		1.40	
Net migration rate	0.64%		0.54%		0.44%	
Mortality	50% of best-estimate improvement rate		1995-97 Canada Life Tables with improvements		150% of best-estimate improvement rate	
CPP disability incidence rates (per 1,000 eligible)	Males	3.00	Males	3.25	Males	3.50
	Females	3.25	Females	3.50	Females	3.75
Labour force participation (2030+) (15-69)	Males	77%	Males	78%	Males	79%
	Females	67%	Females	69%	Females	70%
Unemployment rate	7.0%		6.5%		6.0%	
Real-wage differential	1.0%		1.2%		1.4%	
Rate of increase in prices	2.5%		2.7%		3.0%	
Real rate of return on investments	4.5%		4.1%		3.7%	
<b>Steady-State Rate</b>	<b>9.3%</b>		<b>9.8%</b>		<b>10.3%</b>	

**Table 18 Financial Status Under Younger Population Scenario**  
(\$ billion)

<b>Year</b>	<b>Paygo Rate (%)</b>	<b>Contribution Rate (%)</b>	<b>Contributory Earnings</b>	<b>Contributions</b>	<b>Expenditures</b>	<b>Net Cash Flow</b>	<b>Investment Earnings</b>	<b>Assets at 31 Dec.*</b>	<b>Asset/Expenditure Ratio</b>
<b>2004</b>	8.25	9.9	289.4	28.7	23.9	4.8	4.7	77.1	3.09
<b>2005</b>	8.33	9.9	299.6	29.7	25.0	4.7	5.8	87.6	3.36
<b>2010</b>	8.61	9.9	369.3	36.6	31.8	4.8	9.8	151.8	4.53
<b>2015</b>	9.01	9.9	464.6	46.0	41.9	4.1	16.0	240.9	5.44
<b>2020</b>	9.60	9.9	578.2	57.2	55.5	1.7	23.8	357.7	6.09
<b>2025</b>	10.42	9.9	701.9	69.5	73.1	(3.6)	32.7	496.3	6.44
<b>2050</b>	10.65	9.9	2,020.2	200.0	215.1	(15.1)	135.7	2,063.9	9.21
<b>2075</b>	10.02	9.9	5,854.8	579.6	586.4	(6.8)	671.6	10,242.8	16.75

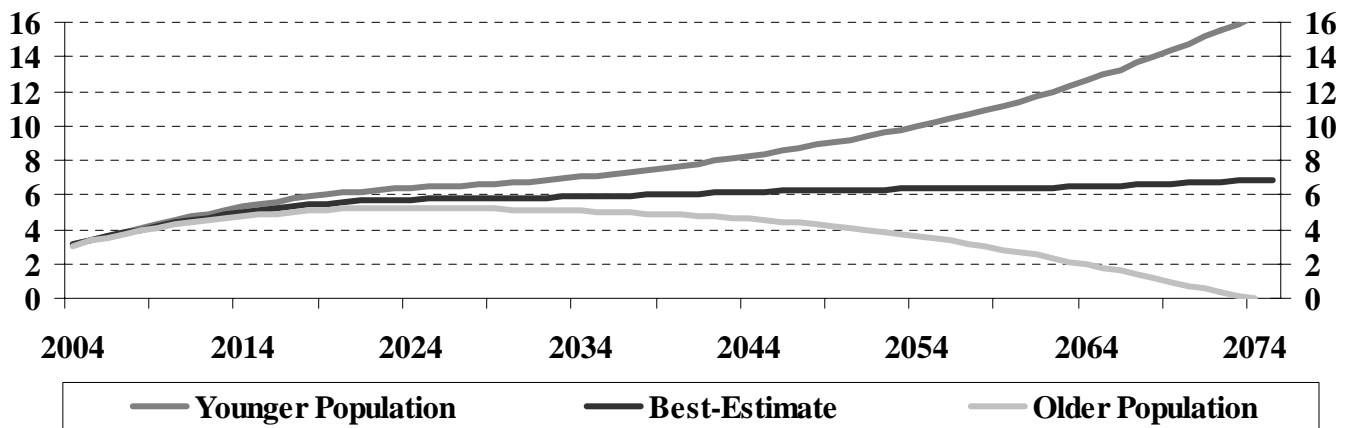
\* All asset components are valued at market.

**Table 19 Financial Status Under Older Population Scenario**  
(\$ billion)

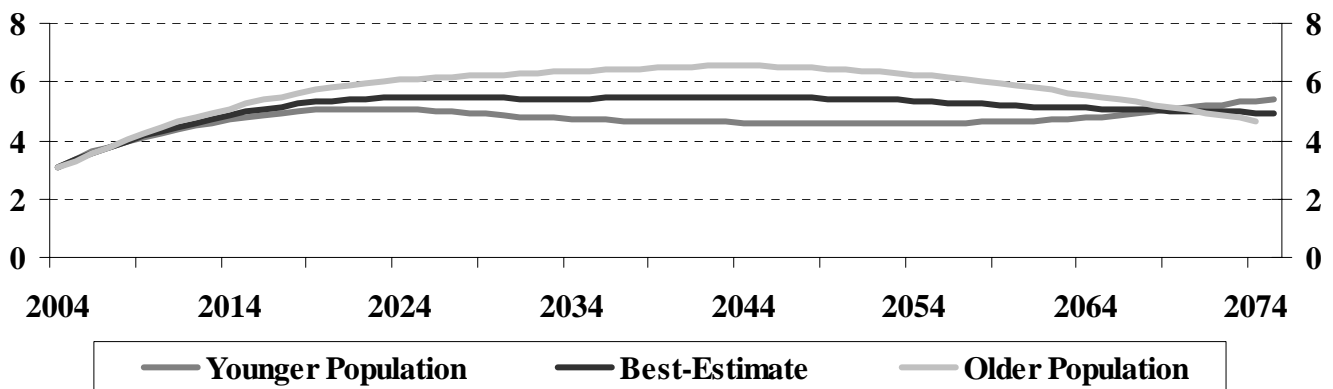
Year	Paygo Rate (%)	Contribution Rate (%)	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Earnings	Assets at 31 Dec.*	Asset/Expenditure Ratio
2004	8.27	9.9	288.8	28.6	23.9	4.7	4.3	76.7	3.07
2005	8.37	9.9	298.2	29.5	25.0	4.6	5.3	86.5	3.31
2010	8.80	9.9	363.0	35.9	32.0	4.0	8.3	143.0	4.24
2015	9.19	9.9	461.8	45.7	42.5	3.3	13.8	217.7	4.82
2020	9.68	9.9	595.7	59.0	57.6	1.3	20.2	317.1	5.17
2025	10.37	9.9	751.4	74.4	77.9	(3.6)	27.4	432.6	5.24
2050	12.03	9.9	2,255.6	223.3	271.4	(48.1)	74.0	1,156.5	4.06
2075	12.96	9.9	6,432.0	636.8	833.3	(196.5)	-	-	-

\* All asset components are valued at market.

**Chart 7 Asset/Expenditure Ratio Under Alternative Population Scenarios (9.9%)**



**Chart 8 Asset/Expenditure Ratio Under Alternative Population Scenarios (Steady-State)**



## **E. Financial Markets Volatility**

As a result of the review of the Plan in 1996, it was determined that to ensure the sustainability of the CPP, higher rates of return would be required. Continuing to invest solely in short-term and low risk fixed income instruments was not considered to be an option, since it would ultimately require a higher contribution rate.

Hence, the CPP Investment Board was created to invest the assets of the Plan in a diversified portfolio. This includes investing in equities and other asset classes, as well as fixed income instruments with the aim of achieving higher returns. The role of the CPP Investment Board will become increasingly important as assets are expected to grow rapidly over the next 17 years with contributions to the Plan projected to exceed expenditures over this period. After 2021, investment earnings will be required to meet expenditures.

Historically, equities have shown greater volatility than fixed income instruments (bonds), where volatility is a measure of the magnitude of fluctuation in rates of returns. Investors seeking higher returns may invest in equities; however, greater risk is incurred. This describes a key risk-reward relationship, whereby investors seek a higher level of return over the long term, or an equity risk premium, in exchange for undertaking greater risk. Nevertheless, over the short term, the potential for higher returns exists along with the downside risk of lower returns due to the higher level of volatility.

Higher returns are possible by investing more in equities (thereby incurring more risk) than in relatively safer (less risky) fixed income instruments, which tend to yield lower returns. By investing in lower return and lower risk assets, investment objectives may not be achieved over the long term. If CPP assets were invested solely in long-term federal bonds starting in 2010, a much lower return would be realized. This could, in turn, result in a steady-state contribution rate higher than the currently legislated rate of 9.9%.

Table 20 shows the change in assets resulting from equity returns being different than the best-estimate assumption in each of the years 2017 and 2018. Equity rates of return of -10%, 0%, and +15% are considered to occur in years 2017 and 2018. Cumulative year-end assets and the asset/expenditure ratio are also shown using the 9.9% contribution rate. In all cases, it is assumed that the returns revert back to their best-estimate values from 2019 onward. The best-estimate year-end assets and asset/expenditure ratio are also shown in the table for comparison.

As shown in Table 20, cumulative assets would decrease by \$49 billion or 17% by the end of 2018 as a result of a -10% equity return in 2017 and 2018 compared to the best-estimate assumption. If an equity return of 0% were experienced, then the assets would decrease by \$22 billion. The effect is reversed in the event of a strong positive return of 15% with the assets increasing by \$22 billion by the end of 2018.

**Table 20 Financial Status Under Various Equity Returns in 2017 and 2018**  
(9.9% contribution rate)

Year	Best-Estimate Equity Returns		Equity Returns in 2017 and 2018								
			-10%			0%			+15%		
	Assets at 31 Dec.	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio	Assets at 31 Dec.	Change in Assets	A/E Ratio
	(\$ billion)		(\$ billion)	(\$ billion)		(\$ billion)	(\$ billion)		(\$ billion)	(\$ billion)	
<b>2010</b>	147	4.4	147	–	4.4	147	–	4.4	147	–	4.4
<b>2016</b>	246	5.2	246	–	5.2	246	–	5.2	246	–	5.2
<b>2017</b>	266	5.3	242	(24)	4.8	256	(10)	5.1	276	10	5.5
<b>2018</b>	287	5.4	238	(49)	4.5	266	(22)	5.0	310	22	5.8
<b>2019</b>	309	5.5	257	(52)	4.6	286	(23)	5.1	333	24	5.9
<b>2020</b>	332	5.6	276	(56)	4.6	307	(25)	5.2	358	26	6.0
<b>2025</b>	455	5.8	376	(78)	4.8	420	(34)	5.3	490	36	6.2
<b>2030</b>	591	5.8	483	(109)	4.7	543	(48)	5.3	641	50	6.3
<b>2050</b>	1,554	6.3	1,147	(407)	4.6	1,375	(179)	5.6	1,739	185	7.0

As the return on the assets increases, the asset/expenditure ratio also increases. Higher returns provide room for the assets to absorb some of the impact of future adverse experience. Higher returns would also cause the steady-state contribution rate to decrease. For instance, in the case of an equity return of +15% in years 2017 and 2018, the steady-state contribution rate would decrease from 9.8% to 9.7%. Conversely, negative returns remove room to offset adverse experience. In the case of an equity return of -10% in years 2017 and 2018, the steady-state contribution rate would increase from 9.8% to 10.0%.

Contributions are projected to exceed expenditures until 2021 after which time investment earnings will be required to pay for expenditures. Thus, assets are expected to grow until 2021 even though negative returns occur in 2017 and 2018, while after this period negative returns cause the assets to decrease from one year to the next. However, if the Plan were solely invested in less risky fixed income instruments, this would result in the steady-state contribution rate increasing significantly as investment earnings would not be sufficient to meet expenditures in the long term. It is for this reason that the CPP Investment Board was created to invest the assets in a diversified portfolio, including equities as well as other classes, necessarily incurring risk, with the purpose of earning higher rates of return to help ensure the long-term financial sustainability of the Plan.

## VI. Conclusion

The results contained in this report confirm that the legislated contribution rate of 9.9% in 2004 and thereafter is sufficient to pay for future expenditures and to accumulate assets of \$147 billion (4.4 times the annual expenditures) in 2010. In 2050, the assets are projected to be \$1,554 billion or 6.3 times the annual expenditures.

The steady-state contribution rate determined under this report is 9.8%. Better than anticipated economic experience, especially regarding labour force participation and employment data, over the period 2001 to 2003, combined with the amendments since the last report, have put downward pressure on the steady-state contribution rate. On the other hand, a more pessimistic demographic outlook, due to the continuing downward trend in fertility rates and increases in longevity, combined with lower expectations with respect to inflation and rates of return on investments, have put upward pressure on the steady-state contribution rate. These factors tend to counterbalance each other, leaving the steady-state contribution rate unchanged at 9.8%.

To measure the sensitivity of the long-term projected financial position of the Plan to changes in the future economic and demographic outlook, two demographically based scenarios that portray a generally younger and older population were developed. The younger and older population scenarios produced steady-state contribution rates of 9.3% and 10.3%, respectively.

Under the legislated 9.9% contribution rate, the assets are projected to grow rapidly over the next 17 years as contributions are expected to exceed expenditures over that period. The asset/expenditure ratio will grow from 3.1 in 2004 to 5.6 in 2021, and remain somewhat stable as the baby boom generation retires between 2015 and 2035. The retirement of the baby boomers will create upward pressure on the Plan outflows as part of the investment income will be required to pay for benefits since contributions will not be sufficient to cover the benefits. However, assets will continue to grow until the end of the projection period, but at a slower pace and the asset/expenditure ratio is expected to reach a level of 6.3 by 2050.

These are indicators that the Plan is sustainable over the long term, as it is projected that there will be more inflows than outflows to the Plan over the entire projection period. The pool of assets generated over the projection period provides the Plan with the capacity, through investment earnings, to absorb some of the possible unforeseen economic or demographic fluctuations, which otherwise would have to be reflected in the legislated contribution rate. Thus, despite the substantial increase in benefits paid as a result of an aging population, the Plan is expected to be able to meet its obligations throughout the projection period. There exist other measures of the long-term sustainability of the Plan and these are presented in Appendix D of this report.

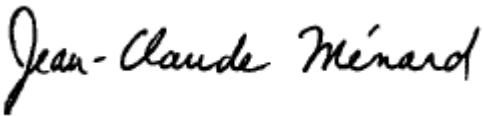
The projected financial status of the Canada Pension Plan presented in this report is based on the assumed demographic and economic outlook over the long term. Therefore, it remains important to review the Plan's long-term financial status on a regular basis by producing periodic actuarial reports. For this purpose, as required by the *Canada Pension Plan*, the next such review will be as at 31 December 2006.

## VII. Actuarial Opinion

In our opinion, considering that this Twenty-First Actuarial Report was prepared pursuant to the *Canada Pension Plan*:

- the methodology employed is appropriate and consistent with sound actuarial principles;
- the data on which this report is based are sufficient and reliable; and
- the assumptions used are, in aggregate, reasonable and appropriate.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice.



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Jean-Claude Ménard, F.S.A., F.C.I.A.  
Chief Actuary



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Michel Montambeault, F.S.A., F.C.I.A.  
Senior Actuary



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Michel Millette, F.S.A., F.C.I.A.  
Senior Actuary

Ottawa, Canada  
18 November 2004