Régie des rentes du Québec

Actuarial Report

of the Québec Pension Plan
as at 31 December

2003

Québec

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Mr. Claude Béchard
Minister of Employment, Social Solidarity
and Family Welfare
Gouvernement du Québec

Dear Sir:

I have the honour to transmit to you the actuarial report as at 31 December 2003 that the Régie des rentes du Québec has caused to be prepared in accordance with section 216 of the *Act respecting the Québec Pension Plan*.

Very truly yours,

Pierre Prémont, M.B.A., Ph.D., C.A.

President and General Manager

Mr. Pierre Prémont
President and General Manager
Régie des rentes du Québec

Dear Sir:

I have the honour to present to you the eleventh regular actuarial report of the Québec Pension Plan, which was prepared in accordance with the mandate entrusted to us. The report was prepared as at 31 December 2003, pursuant to the provisions of section 216 of the *Act respecting the Québec Pension Plan*.

A number of people have devoted considerable effort to its realization and we are grateful to them.

Respectfully submitted,

Denis Latulippe, F.S.A., F.C.I.A.

Chief Actuary

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Actuarial Report

1. Introduction

In accordance with section 216 of the *Act respecting the Québec Pension Plan*, the Régie des rentes du Québec must cause to be prepared at least once every three years an actuarial report of the Québec Pension Plan. In accordance with the *Act*, the actuarial report must contain projections, over a 30 year or longer period, of the Plan's cash inflows and outflows and their effect on the long-term accumulation of the Plan's reserve.

The actuarial report serves to inform the government, contributors and beneficiaries of financial changes in the Plan and, where necessary, to review its funding or some of its provisions. Demographic and economic information is updated in each actuarial report and assumptions are adjusted in accordance with any changes that have occurred within the Plan environment.

This report, as at 31 December 2003, is the third regular report since the passage in December 1997 of the *Act to reform the Québec Pension Plan and to amend various legislative provisions*, which came into force on 1 January 1998. The reform brought in a rapid increase of the contribution rate, which has increased from 6,0 in 1997 to 9,9% in 2003. In accordance with the *Act*, this rate will remain constant in the years to come.

Based on the methodology and assumptions made, the projection of the reserve that is contained in this report enables us to assess the long-term sufficiency of the Plan's fund and the stability of Plan funding. Other projections are also given, so as to evaluate the sensitivity of the reserve and contribution rate with variations in the main demographic and economic assumptions.

The actuarial report covers how the Plan is funded, the methodology of the actuarial analysis, the main assumptions made and the results obtained. It is followed by six appendixes, which show changes in the Plan's funding over time, a summary of the main provisions of the *Act*, a detailed description of the assumptions and methodology, changes in the reserve based on the steady-state contribution rate, sensitivity tests on the results and a comparison of the results with those contained in the actuarial report as at 31 December 2000.

2. Plan funding

This section briefly explains how the Plan is funded. Appendix I gives more details on changes in the Plan's funding over time.

Initial strategies

At the Plan's inception in 1966, the government adopted a partially funded approach, which is between a pure pay-as-you-go funding scheme[1] and full capital funding[2]. This method of funding allowed the constitution of a contingency reserve amounting to just a few years of benefits in order to protect the Plan against economic fluctuations. The Plan's funding objective has never been full capital funding of the sort required for private pension plans, which may be terminated at any time.

The fact that the initial contribution rate of 3,6% would have to be increased as time went by was acknowledged in 1966. However, changes in the economic and demographic environments as well as amendments to the to the Plan's provisions created additional upward pressure on the contribution rate. In that context, the contribution rate increased from 3,6% in 1986 to 5,6% in 1996, based on a funding scheme intended to maintain a minimum reserve equal to twice the cash outflows for the following year throughout the projection period.

The 1998 reform

The 1998 Plan reform caused the contribution rate to increase more rapidly, from 6,0% in 1997 to 9,9% in 2003. The rate is set by law at the 2003 rate for subsequent years. The reform with its subsequent increase in contribution rates, was aimed at ensuring the Plan's continuation and to improve fairness between the generations of contributors. More concretely, the objective was to stabilize the contribution rate so that future generations of workers will make contributions based on the same rate for a similar level of benefits.

The reform made it possible to strengthen the Plan's long-term funding by fuller funding. Since the fund is higher, it will make it possible not only to reduce the effects of economic fluctuations but also the effects of the significant demographic changes that are expected in the next three decades.

Unlike the Québec Pension Plan, a large number of social security plans have pure pay-as-you-go funding and therefore accumulate no assets. Because of an aging population, the increase in the number of retirees, compared with the number of workers has a direct effect on the level of contributions needed to fund such plans. The Québec Pension Plan's partial capital funding makes it possible to reduce that effect because a portion of the investment income generated by the Plan's reserve can be used to offset increased benefits.

In spite of funding increases, which make it possible to generate more investment earnings, the main source of funding is still the contributions paid by employers and workers. Changes in the Plan's finances are therefore dependent not only on capital market yields but also on the demographic and economic changes that may have an impact on the labour force and on the total payroll from which contributions are deducted.

1. In a pure pay-as-you-go funding scheme, the contributions of a given year are used to pay the benefits of the same year.
2. In a fully funded plan, the aggregate contributions made throughout the active life of a group of workers are used to pay all of that group's benefits.

A monitoring mechanism

As indicated in the last working paper on the Plan,[3] two indicators help to monitor the Plan's funding situation. The first, which is the ratio of the reserve at the end of one year to the cash outflows for the following year, serves to monitor the relative size of the reserve. It indicates if the Plan's funds are sufficient, based on a contribution rate of 9,9%. The funding situation would require particular attention if, over the projection period, the reserve fell below the minimum level targeted prior to the 1998 reform, that is, twice the annual cash outflows.

The second indicator is the steady-state contribution rate, which is used to determine the Plan's long-term funding stability. This indicator is the contribution rate for future years that would be required to maintain a constant ratio of the reserve to annual cash outflows over the long term. The detailed results of these two indicators appear in section 5.

If the steady-state contribution rate was applied over the entire projection period, the reserve would generate sufficient investment income to make up the difference that appears when contributions do not cover cash outflows. The reserve would therefore increase at the same rate as cash outflows and maintain the long-term stability of the ratio of the reserve to annual cash outflows.

The steady-state contribution rate is an indicator of the "ideal" state of the Plan's funding. In reality, it is not necessary for the Plan to be perfectly balanced. A certain difference between the actual contribution rate set by law and the steady-state rate can be tolerated without making an adjustment to the Plan necessary.

Based on simulations performed by Régie actuaries, a 0,3 percentage point difference compared to the steady-state contribution rate can be considered an acceptable tolerance zone. On the other hand, a difference greater than 0,3 below the steady-state contribution rate, translates into a reserve lower than twice the annual cash outflows at the end of the projection period. Adjustments to the Plan could then be necessary.

Fluctuations in the steady-state contribution rate from one actuarial report to another may depend on conjunctural phenomena, the consequences of which could be mitigated (or aggravated) in the future. A difference of more than 0,3 of a point between the 9,9% contribution rate and the balanced rate may warrant changes to the Plan, strictly from a funding perspective. However, to be certain that such a difference will persist, it must be noted in two consecutive actuarial reports. The consultation that is required by law every six years since the 1998 reform would therefore provide an opportunity to discuss the measures necessary to restore balance to the Plan's funding.

3. *Adapting the Pension Plan to Québec's New Realities*, Régie des rentes du Québec, 2003.

3. Methodology

The valuation of a public plan like the Québec Pension Plan consists of projecting the cash inflows and outflows of coming years so as to be able to estimate changes in the reserve, which varies from one year to the next as a function of the difference between cash inflows and outflows.

Projection of cash inflows and outflows

The analysis used for this report was based on an actuarial model for projecting demographic and economic factors so as to determine the level of future cash inflows and outflows. The model requires a number of data, in particular, data on the Plan's contributors and beneficiaries, as well as the establishment of several assumptions. The actuarial analysis was made in accordance with the provisions of the Plan as defined in the *Act respecting the Québec Pension Plan* and described in Appendix II of this report.

The method used consists in projecting the population of Québec on the basis of assumptions made for fertility, migration and mortality. The projected population, based on the number of persons in each age group, serves to determine both the population that contributes to the Plan and the population eligible for the Plan's various benefits.

Contributions and investment income make up the Plan's cash inflows. For each year in the projection period, total contributions are determined from the total contributory payroll and the contribution rate prescribed by law. The total payroll is estimated on the basis of the projected rates of participation in the Plan and future pensionable earnings. Investment earnings are calculated on the basis of yield assumptions for the different types of investment.

Cash outflows are made up of the benefits paid out and administration costs. Benefits are projected using assumptions based mainly on the Plan's experience (for example, disability incidence rates) and applied to the population eligible for benefits. Administration costs are projected on the basis of the Régie des rentes's budgets and the agreement with the Québec Ministère du Revenu on the collection of contributions.

In accordance with the legislative provisions adopted as part of the Plan's reform, the *Act respecting the Québec Pension Plan* prescribes a contribution rate of 9,9%. Therefore, the assumptions and results presented in the following sections make it possible to measure changes in the reserve on the basis of this rate. It is thus possible to verify whether the contributions collected plus investment income will be sufficient to fund cash outflows and ensure a sufficient reserve at the end of the projection period.

Projection period

To adequately evaluate the Plan's future financial situation, it is important to project cash inflows and outflows beyond the minimum period of 30 years prescribed in the *Act*. It is important that the projection period make it possible to fully understand the extent of the demographic transformation that will occur between 2010 and 2030 because of the massive numbers of baby boomers who will reach retirement age. That phenomenon will have an important impact on the Plan because of the large increase in the number of beneficiaries.

The selected projection period extends over a period of 52 years to 2055. During this period, the number of retirees will stabilize, which makes it possible to determine the steady-state contribution rate. This period will also

enable the inclusion of the majority of the baby-boom effects on the Plan's funding, because in 2055, the youngest baby-boomers will be 90 years old. This projection period is also consistent with the projection periods of the actuarial analyses of the Plan produced since 1988, which extended over a minimum 50-year period.

However, the uncertainty associated with the projections in an actuarial report increases over time. As we go further into the projection period, the number of contributors and the profile of earnings for future retirees are less and less certain and depend more and more on the assumptions made. Furthermore, a small but recurring yearly fluctuation in the difference between cash inflows and outflows may significantly affect the level of the reserve accumulated over the long term.

A longer projection period may therefore translate into very unpredictable results from one actuarial report to another, and would not necessarily allow for an accurate appraisal of the Plan's funding. Besides, use of the steady-state contribution rate serves as a means to appraise the stability of long-term funding of the Plan within a 50-year period.

4. Assumptions

The production of an actuarial report requires making assumptions on the demographic and economic environment as well as a certain number of assumptions specific to the Plan's experience. This section describes the main assumptions made for this analysis. Appendix III provides more information on this subject and the accompanying Table 13 presents a summary of the demographic and economic assumptions that have a determining influence on the report's results.

Since the purpose of the actuarial report is to forecast the long-term changes in the Plan's cash inflows and outflows until 2055, the assumptions must be made from a long-term perspective. The assumptions take into account historical trends without giving unjustified importance to recent situations that may be the result of a particular juncture.

In addition to historical data and historical trends, several elements are taken into account in the elaboration of assumptions, including the opinion and forecasts of experts,[4] comparisons with the assumptions made by other public plans at the national and international level as well as public policy with respect to inflation, immigration and other areas. Assumptions are selected on the basis of data as at 31 December 2003 that were available in March 2004, except for certain data on contributions, which became available in May 2004.

The assumptions are interrelated and must form a coherent whole. For example, they must take into account the important interrelations between demographic factors and economic factors. The assumptions made, from an overall perspective, represent the authors' best estimate of population and economic changes and in particular, variables that affect benefits.

Although assumptions are determined in a reasonable manner, there will be differences between the future reality and assumptions made. These differences may have an effect on the financial situation of the Plan upwardly or downwardly, compared to the results of this actuarial analysis. They will by analyzed and included in subsequent actuarial analyses.

4.1 Demographic assumptions

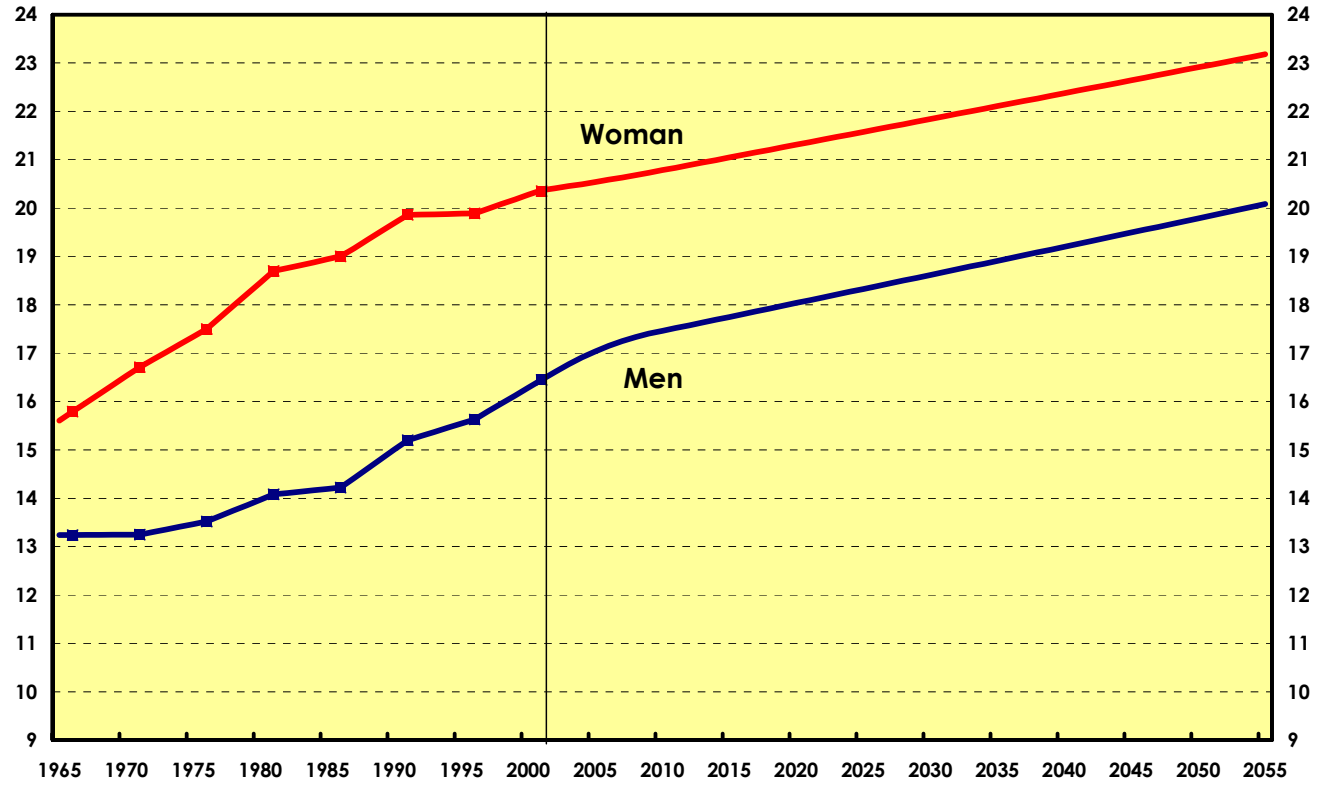
A projection of the Québec population is the basis for determining the number of Plan contributors and beneficiaries. The projection begins with the population estimated by Statistics Canada as at 1 July 2003, to which are applied the mortality, birthrate and migration assumptions.

The current population structure strongly influences the results of projections for the years to come. The age distribution of the initial population shows a significant aging of the Québec population. The first cause of this aging is the large drop in birthrates in the 1960s and a continuing low level thereafter.

The effect of low birthrates on the population distribution amplified because it follows the high birthrates observed during the baby boom in Québec between 1945 and 1965.

4. One of the principal sources of projections is a seminar organized by the Régie des rentes in September 2003 entitled "Perspectives démographiques, économiques et financières, 2003-2030".

Chart 1
Changes in life expectancy at age 65



In the 1950s, the average fertility rate was 4,0 children per woman. It dropped rapidly thereafter to a level below 2,0 in 1971. Thereafter, the rate oscillated between 1,4 and 1,8 children, giving a 30-year average of 1,6.

The second cause of the aging of the population is the large reduction in age-specific mortality rates. Since the Plan began, that phenomenon has been manifested as a rapid increase in life expectancy. The amounts paid out in benefits therefore increase significantly because the benefit payment period increases with a longer life expectancy.

As Chart 1 indicates, life expectancy at age 65 increased by 25% for men between 1966 and 2001, rising from 13,2 to 16,5 years. For women, life expectancy at age 65 increased from 15,8 to 20,4 years during the same period, which is an increase of 29%.

Demographic projections are based on several assumptions, which are detailed in Appendix III and can be summarized as follows:

- The **total fertility rate** is 1,47 children per woman in 2004. It will gradually rise, reaching 1,60 in 2015 and remain constant thereafter. The average rate is 1,57 between 2003 and 2032. The number of children per woman in a particular generation (measured at age 45), which was 1,62 in 2003, will drop until 2026, reaching its lowest level of 1,53 in 2026 and increasing thereafter to 1,60 around 2040.

- **Net migration** was 18 500 people in 2004, that is, 0,25% of the population, which reflects the average level observed between 2000 and 2002. It will increase progressively to reach 23 000 people (0,30% of the population) in 2010 and remain stable thereafter. Net international migration will be 30 500 people at that time and Québec will have a negative net interprovincial migration of 7 500 people.

- **Mortality rates** drop continually over the entire projection period. This reduction is established by age and sex based on historical data and the mortality reduction rates used by the United States Social Security Administration. The overall reduction obtained is twice as slow as that observed on average over the last thirty years. Chart 1 shows the changes in life expectancy at age 65 since the beginning of the Plan until the end of the projection period. In 2055, life expectancy at age 65 reaches 20,1 for men and 23,2 for women. A closing of the gap between men and women is supposed: the difference between them will drop from 3,9 years in 2001 to 3,1 in 2055.

Any differences between these assumptions and the actual rates of birth and mortality as well as the actual net migration in the coming decades will have an effect on the exact distribution of the population by age. It is unlikely, however, that such changes could significantly reduce the aging of the population, which has already begun, as a result of the drop in birthrates and the increase in life expectancy.

By projecting the population over a long period, it is possible to grasp the magnitude of the upheavals caused to the age pyramid. The result is a gradual transition to an older society whose demographic structure is significantly different from the structure when the Plan was created. This transformation will be a determining factor in changes in the Plan's financial situation over the long term.

As Chart 2 illustrates, the distribution of the population in 1970 resembles an age pyramid, where there is a larger number of people in the younger age groups. Baby boomers are represented in the chart by darkly shaded areas. In 1970, they were between ages 5 and 24, and represented more than 40% of the population.

Chart 2 also shows the distribution of the population in 2005, 2025 and 2045. It illustrates the effect the drop in birthrates and a longer life expectancy have on the distribution. In 2005, there are 650 000 more baby boomers, whose age is between 40 and 59, than that portion of the population under age 20, which will significantly impact the labour market.

In 2025, the same group, then between the ages of 60 and 79, will still account for approximately one quarter of the total population, and it will for the most part be retired. In 2045, the people in this group, who will be age 80 and over, will be approximately 825 000, tripling the population of this age group when compared with 2005 and therefore representing approximately 10% of the total population.

Table 1 shows population changes for three age groups (0 to 19, 20 to 64 and 65 and over) for the projection period of 2004 to 2055, as well as the ratio of the population aged 20 to 64 to the population aged 65 and over. Because of population aging, the ratio changes quickly, from 4,7 in 2004 to 2,5 in 2025.

The ratio between the populations is an approximate indication of the ratio of the number of workers to retirees, which is an important factor in Plan funding. Therefore, the number of workers for each retiree, which was approximately 5 in 2003, will fall to 2,5 in 2025 and will drop below 2 in 2055.

Table 1 also illustrates that the number of people age 65 and over is relatively stable as of 2035, whereas the population between age 20 and 64 begins to continually decrease after 2014.

Additional population data are presented in section 2.5 of Appendix III, including the percentage of the population aged 65 and over.

Chart 2

Population of Québec

(in thousands, by 5-year age group according to the last birthday)

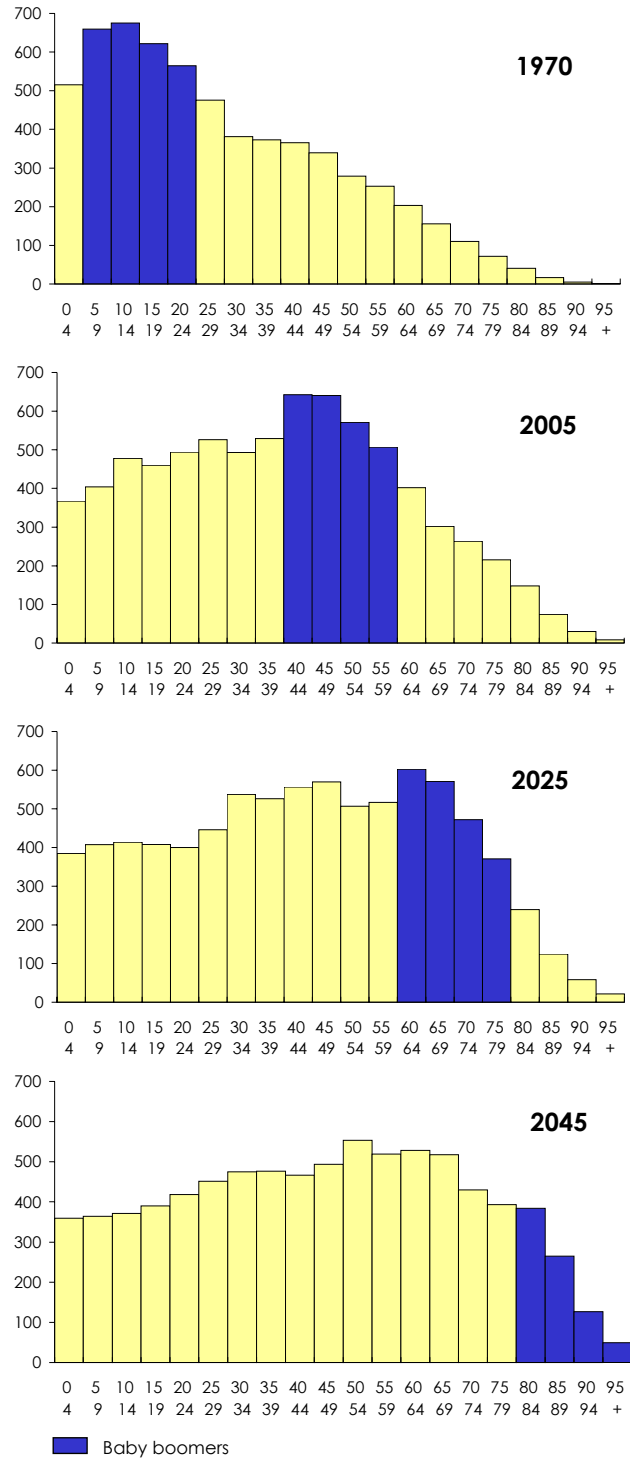


Table 1

Projected population of Québec

(in thousands, on 1 July, age at the last birthday)

YEAR	ALL AGES *	0 TO 19	20 TO 64	65 AND OVER	RATIO: 20 TO 64 / 65 AND OVER
2004	7 521	1 723	4 778	1 021	4,7
2005	7 555	1 709	4 805	1 041	4,6
2006	7 590	1 697	4 827	1 066	4,5
2007	7 625	1 688	4 844	1 092	4,4
2008	7 660	1 681	4 857	1 122	4,3
2009	7 696	1 671	4 871	1 154	4,2
2010	7 732	1 655	4 889	1 188	4,1
2011	7 767	1 637	4 905	1 225	4,0
2012	7 802	1 621	4 914	1 266	3,9
2013	7 835	1 608	4 920	1 308	3,8
2014	7 868	1 599	4 920	1 349	3,6
2015	7 901	1 591	4 919	1 391	3,5
2020	8 040	1 596	4 832	1 612	3,0
2025	8 133	1 614	4 662	1 857	2,5
2030	8 169	1 596	4 512	2 062	2,2
2035	8 154	1 553	4 477	2 124	2,1
2040	8 103	1 510	4 463	2 130	2,1
2045	8 031	1 485	4 382	2 164	2,0
2050	7 946	1 478	4 294	2 174	2,0
2055	7 859	1 474	4 220	2 166	1,9

* In this table and others, the total is not necessarily equal to the sum of the parts, since figures have been rounded off.

4.2 Economic assumptions

The economic assumptions are related to changes in activity rates, employment rates, unemployment rates, the inflation rate, average employable earnings and the rate of return on investments.

Economic assumptions are described in detail in Appendix III and can be summarized as follows:

- The **activity rate**, which is the ratio between the number of people who are active and that portion of the population age 15 and over, is determined by the interaction of numerous factors. The age distribution of the population according to sex is the most influential factor. An aging population will result in downward pressure on the global activity rate by the year 2030.

  The impact of an aging population, however, will be offset in part by mainly social and economic factors. These factors include improved labour market conditions, due to an anticipated manpower shortage and a higher level of education among older workers. These factors, combined with an increased life expectancy and, in turn, a need to finance one's retirement, should sway workers to remain at work longer, possibly involving phased retirement from the labour market.

  Taking these factors into account, a gradual increase in the activity rates for men and women between the ages of 25 and 64 is expected.

  For men, because activity rates are already very high, future increases will be moderate. The increases will also be more marked among men aged 55 to 64.

  For women, the increase in activity rates is more significant for all age groups. The higher participation of women in the labour market, which began several decades ago, will continue at a slower pace than in the past for women aged 25 to 54 and at a faster pace for women aged 55 to 64.

  The global activity rate for the population aged 20 to 64 will increase more moderately than in the past. This can be attributed primarily to the presence of large numbers of baby boomers in age brackets where activity falls, that is, beginning at age 50.

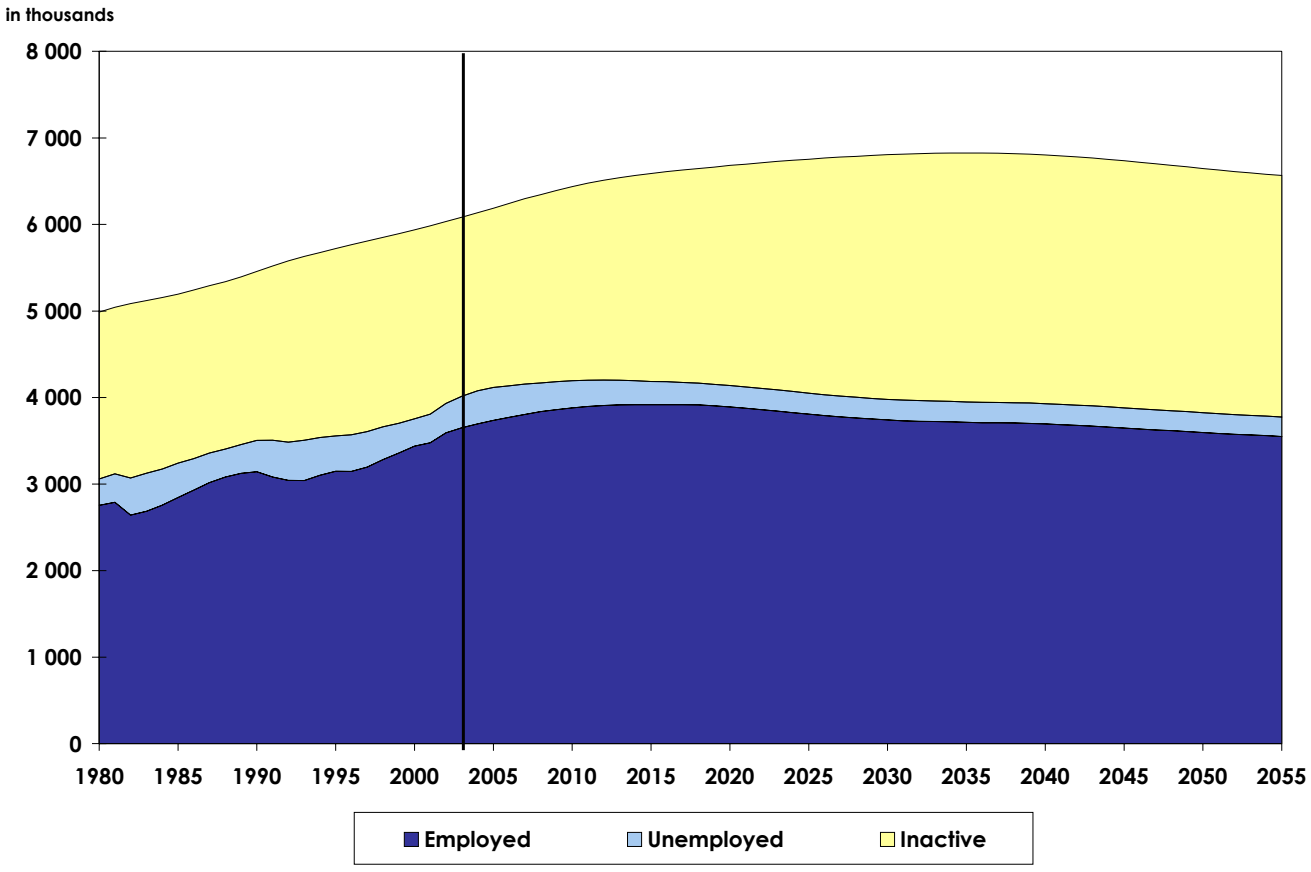
  The aggregate activity rate for the population aged 15 and over grew 7,2 percentage points between 1976 and 2003. Due to an aging population, it will fall 7,5 percentage points between 2003 and 2030, from 66,0% to 58,5%. Thereafter, it will decline at a slower pace, reaching 57,5% in 2055.

  Once the activity rates are determined on the basis of age group and sex, they are applied to the projected population aged 15 and over to obtain the active population. This projection reveals slower growth of the active population up to 2012, followed by a continuous decline for the remainder of the projection period (up to 2055).

- The **employment** projection takes into account the increasing scarcity of manpower, during which unemployment will gradually fall. The unemployment rate will reach its lower limit of 6% in 2018. In the long term, employment changes keep pace with labour force changes. Employment will increase at an average rate of 1,0% between 2003 and 2010, remain stable between 2010 and 2020 and will decrease by 0,4% on average between 2020 and 2030. The drop in employment levels will be slower since there will be a lessening of the downward demographic pressure on changes in the labour force.

Chart 3 shows the changes in the population aged 15 and over according to labour force status.

Chart 3
Distribution of the population aged 15 and over



- The desire of the Bank of Canada and the federal government to keep the **inflation rate** inside a target zone of 1% to 3% until the end of 2006 leads us to expect a low inflation rate during the coming years.

  The assumed annual inflation rate is 1,5% in 2004. It will gradually increase to 2,0% in 2007 and remain at that level until 2009. Thereafter, the inflation rate will increase 0,1 % annually, and approach the historical average. It will reach its projected long-term rate of 2,5% in 2014.

- The **real rate of increase in average employment earnings** in the long term is tied to increases in productivity. This assumption also takes into account an anticipated tightening of the labour market.

  Between 2004 and 2014, the nominal rate of increase in average earnings will rise from 1,9% to 3,7%. After excluding inflation, the real rate of increase is 0,4% in 2004. Then it will rise steadily, reaching 1,2% in 2010 and remaining constant thereafter.

- The **real rate of return** is represented by the difference between the nominal rate of return and the inflation rate. This assumption is based on an analysis of historical trends and rate of return projections for each investment category. The valuation of the global rate of return for the Plan's fund takes into account the distribution of investments by category and the fees related to fund management.

  The projected real rate of return is 4,4% in 2004. It increases gradually to 4,9% then remains at this level from 2009 to 2015. Thereafter, it gradually decreases until 2025, when it will reach 4,6%. Over the entire projection period (2004 to 2055), the average real rate of return is 4,7%.

4.3 Other assumptions

The Plan's actuarial report includes other assumptions; the main ones are the retirement rate and the disability incidence rate. Appendix III contains a detailed description of the assumptions that pertain to benefits.

4.3.1 Retirement rate

For the purposes of this report, the retirement rate is the ratio of the number of persons who become beneficiaries of a retirement pension at a given age to the total number of eligible persons at the same age. It makes it possible to determine when retirement benefits become payable.

The normal retirement age under the Plan is 65. However, since 1984, a person can choose to receive a reduced retirement pension as of age 60 if he or she meets certain conditions. The average age at which retirement pensions began was 63,4 for men aged 60 in 1984. It is now estimated to be 62,1 (for those who reached age 60 in 2003). For women, the average age decreased from 63,1 to 61,5 during the same period. That change is reflected in an increase in the retirement rate at age 60 and by a decrease in the retirement rate for the other ages comprised between age 61 and age 65.

During the same period, from 1984 to 2003, the activity rate for men age 60 to 64 dropped from 53,8% to 46,7%, that is, a decline of 7,1 percentage points. The activity rate for women, however, did not decrease, because of their increasing presence in the labour force. The projection of the retirement rate is linked to changes in the activity rate for persons aged 60 to 64. However, those rates do not vary in direct proportion. In fact, it is possible to be considered to be in the labour force and to receive a retirement pension at the same time, for example, under the provisions of the

Plan for phased retirement and because a retiree can return to the labour force after retirement.

The expected increase in activity among people aged 60 to 64 during the projection period is reflected by a decrease in the number of workers who will in fact retire at age 60. The retirement rate at age 60, which is 50% for men and 62% for women in 2004, will decrease respectively to 43% and 51% for the generations that will reach age 50 in 2055. Consequently, retirement rates between the ages of 61 and 65 are higher. After age 65, they are practically nil.

Thus, the average age when a pension begins will increase by 0,2 year for men, reaching 62,3 in 2055. For women, it will increase by 0,6 year, reaching 62,1 in 2055.

4.3.2 Disability incidence rate

The disability incidence rate for a given year is equal to the ratio of the number of new disability pension beneficiaries during that year to the number of persons who meet the eligibility conditions for a disability pension. It is developed from the Plan's experience from 1999 to 2001.

The disability incidence rate has a direct impact on the number of new disability pensions. It is given for certain ages in Table 38 of Appendix III. The rate increases as a function of age and there is a marked increase as of age 60, mainly because of the broadened definition of disability that begins to apply at that age.

Disability incidence rates for women have increased substantially in recent years and are now higher than rates for men aged 35 to 54. Between ages 55 and 64, the rates for women remain lower than those for men.

5. Results

5.1 Contributions

Plan contributions are determined by the number of contributors, the contributory earnings and the contribution rate. Thus, the demographic and economic assumptions described in the preceding sections have a large impact on the level of future contributions. Appendix III describes in more detail the method used to calculate contributions.

Generally, people whose annual employment earnings exceed the basic exemption (3 500 $) contribute to the Plan. Because of the freeze of the basic exemption and increase in the number of employed persons, the number of contributors will increase continually throughout the projection period, until 2018. It will increase on average 0,6% per year, from 3 649 000 in 2004 to 3 967 000 in 2018. Thereafter, because of a reduction in the labour force, it will drop by 209 000, reaching 3 758 000 in 2055.

Contributory earnings are equal to average pensionable earnings (subject to the prescribed maximum) less the basic exemption. The average annual contributory earnings in 2004 are 24 639 $ for men and 20 226 $ for women.

Table 2 shows changes in contributions. Since the contribution rate is stable at 9,9% over the entire projection period, total contributions will increase only as a function of increases in the total contributory payroll.

Total contributions will increase from 8,3 billion $ in 2004 to 14,5 billion $ in 2018, the year the number of contributors will reach its maximum. Thereafter, the pace of increase in contributions will slow.

Table 2
Changes in contributions

YEAR	NUMBER OF CONTRIBUTORS	TOTAL CONTRIBUTORY PAYROLL	CONTRIBUTIONS*
	(in thousands)	(in millions of $)	(in millions of $)
2004	3 649	82 484	8 303
2005	3 695	85 336	8 587
2006	3 738	88 631	8 916
2007	3 778	92 256	9 277
2008	3 814	96 043	9 655
2009	3 844	99 939	10 044
2010	3 872	104 215	10 470
2015	3 954	128 188	12 862
2020	3 958	156 074	15 643
2025	3 899	185 808	18 609
2030	3 857	221 545	22 175
2035	3 852	266 239	26 632
2040	3 858	320 165	32 011
2045	3 832	382 155	38 194
2050	3 796	454 658	45 426
2055	3 758	539 999	53 942

* Contributions calculated on the basis of the total contributory payroll and contribution rate are increased by the non-refund to employers of certain contribution overpayments and reduced by the expenses related to accounts receivable for contributions.

5.2 Benefits

The Québec Pension Plan provides financial protection in the event of retirement, disability (disability pension, pension for a disabled person's child) and death (surviving spouse's pension, orphan's pension and death benefit). Appendix II describes those benefits. The projection of benefit amounts is based on the assumptions previously described. Section 5 of Appendix III details the method used to determine the number of beneficiaries and average pension amounts.

The projected number of beneficiaries for the period from 2004 to 2055 is shown in Table 3 by type of benefit and is broken down by sex in Table 4.

The number of people receiving a **retirement pension** will double between now and 2025 because of population aging and the rapid growth in the number of women entitled to a retirement pension. Thereafter, the number of beneficiaries will increase more slowly, levelling off as of 2040. The number of retired women will exceed the number of retired men as of 2006. Furthermore, by the end of the projection period, the number of retirement pension beneficiaries will have almost tripled for women and will have doubled for men, compared to 2003.

The increase in the number of **surviving spouse's pensions** will be 30% between now and 2020 and 72% for the entire projection period. The proportion of men among the beneficiaries of a surviving spouse's pension will increase from 12% to 19% during the projection period; that increase reflects the increased participation of women in the Plan.

The number of people receiving a **disability pension** will increase between now and 2020 and then decline. That is partly the result of population aging: by 2020, the more populous cohorts will reach the upper age limit for receiving a disability pension (see Table 1). They will then be followed by less populous cohorts, resulting in a drop in the number of disability pension beneficiaries.

Table 3

Projection of the number of beneficiaries as at 31 December
(in thousands)

YEAR	RETIREMENT PENSION*	DISABILITY PENSION	SURVIVING SPOUSE'S PENSION*	DEATH BENEFIT**	ORPHAN'S PENSION AND PENSION FOR A DISABLED PERSON'S CHILD	REFUND TO SOCIAL ASSISTANCE
2004	1 079,6	72,7	331,9	37,7	30,4	1,6
2005	1 124,4	74,0	338,7	38,7	30,3	1,4
2006	1 172,5	75,2	345,2	39,7	30,1	1,3
2007	1 223,0	75,9	351,6	40,8	29,6	1,1
2008	1 274,5	77,2	357,7	42,0	29,1	1,0
2009	1 327,7	79,0	363,8	43,2	28,6	0,8
2010	1 381,8	80,8	369,9	44,5	28,3	0,7
2011	1 436,4	82,1	376,0	45,8	28,0	0,5
2012	1 491,5	83,5	382,0	47,0	27,7	0,4
2013	1 547,6	84,7	388,0	48,3	27,4	0,3
2014	1 605,0	85,9	394,1	49,7	27,2	0,2
2015	1 662,5	87,1	400,1	50,9	27,1	0,1
2020	1 959,2	90,5	431,4	57,6	26,4	0,0
2025	2 225,5	87,4	465,1	64,6	25,7	0,0
2030	2 375,6	81,4	500,2	72,4	25,0	0,0
2035	2 431,0	82,3	533,0	80,3	24,3	0,0
2040	2 475,3	86,4	558,4	87,2	23,3	0,0
2045	2 504,0	85,1	573,0	91,9	22,2	0,0
2050	2 501,3	83,7	576,0	93,7	21,4	0,0
2055	2 511,6	83,0	569,9	92,9	20,9	0,0

* The number given for beneficiaries of a retirement pension does not take into account that as of 1 January 1994, the retirement pension can be shared between spouses. A beneficiary who receives concurrently a retirement pension and a surviving spouse's pension is listed in the two corresponding columns of the table.

** Number of deceased contributors giving entitlement during the year in question.

Table 4

Projection of the number of beneficiaries as at 31 December, by sex
(in thousands)

	MEN				WOMEN			
YEAR	RETIREMENT PENSION*	DISABILITY PENSION	SURVIVING SPOUSE'S PENSION*	DEATH BENEFIT**	RETIREMENT PENSION*	DISABILITY PENSION	SURVIVING SPOUSE'S PENSION*	DEATH BENEFIT **
2004	547,3	40,8	41,1	25,8	532,3	31,9	290,7	11,9
2005	565,7	41,0	43,3	26,2	558,7	33,0	295,3	12,4
2006	585,7	41,3	45,5	26,8	586,8	33,9	299,7	13,0
2007	607,0	41,3	47,7	27,3	616,0	34,6	303,8	13,5
2008	628,9	41,8	49,9	27,9	645,6	35,5	307,8	14,1
2009	651,7	42,6	52,2	28,5	676,0	36,4	311,7	14,7
2010	675,0	43,3	54,4	29,2	706,8	37,5	315,5	15,3
2011	698,7	43,8	56,7	29,9	737,7	38,3	319,3	15,9
2012	722,6	44,3	58,9	30,5	768,9	39,1	323,1	16,5
2013	746,9	44,8	61,2	31,2	800,7	39,9	326,8	17,1
2014	771,7	45,3	63,4	31,9	833,3	40,6	330,6	17,8
2015	796,8	45,8	65,7	32,5	865,7	41,2	334,4	18,4
2020	927,7	47,5	77,0	35,6	1 031,5	42,9	354,5	21,9
2025	1 047,6	45,8	87,8	38,8	1 177,9	41,6	377,3	25,8
2030	1 114,3	42,3	97,2	42,1	1 261,3	39,1	403,0	30,3
2035	1 136,5	42,8	104,3	45,2	1 294,5	39,5	428,7	35,1
2040	1 157,9	45,1	108,5	47,5	1 317,4	41,3	450,0	39,7
2045	1 175,7	44,3	109,7	48,8	1 328,3	40,7	463,3	43,1
2050	1 177,9	43,5	108,6	49,0	1 323,4	40,1	467,3	44,7
2055	1 186,8	43,3	106,6	48,3	1 324,8	39,6	463,4	44,6

* The number given for beneficiaries of a retirement pension does not take into account that as of 1 January 1994, the retirement pension can be shared between spouses. A beneficiary who receives concurrently a retirement pension and a surviving spouse's pension is listed in the two corresponding columns of the table.

** Number of deceased contributors giving entitlement during the year in question.

Tables 5 and 6 show the amount of projected benefits, by type of benefit, for the period from 2004 to 2055. The data in Table 5 are in current dollars; the data in Table 6 are in 2004 constant dollars.[5]

Plan benefits will increase rapidly. In current dollars, they were 7,5 billion $ in 2004, and will increase to 12,8 billion $ in 2015 and will continue to increase, reaching 67,7 billion $ in 2055. Expressed in constant dollars, benefits at the end of the projection period will have almost tripled from 2004.

5. 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 used as of 2004 in the projections.

Table 5

Projection of benefits

(in millions of current dollars)

YEAR	RETIREMENT PENSION	DISABILITY PENSION	SURVIVING SPOUSE'S PENSION	DEATH BENEFIT	ORPHAN'S PENSION AND PENSION FOR A DISABLED PERSON'S CHILD	REFUNDS TO SOCIAL ASSISTANCE	TOTAL BENEFITS
2004	5 319,8	670,4	1 433,9	94,2	26,3	3,3	7 547,8
2005	5 579,4	690,7	1 473,3	96,6	26,6	3,0	7 869,6
2006	5 876,2	714,1	1 509,5	99,3	26,9	2,7	8 228,6
2007	6 200,5	735,5	1 543,5	102,0	27,1	2,5	8 611,0
2008	6 550,2	759,7	1 579,5	104,9	27,2	2,2	9 023,7
2009	6 920,7	790,9	1 622,8	108,0	27,3	1,9	9 471,6
2010	7 312,8	825,5	1 669,4	111,2	27,5	1,6	9 947,9
2011	7 733,5	860,0	1 714,4	114,4	27,8	1,3	10 451,3
2012	8 184,0	894,9	1 759,8	117,6	28,1	1,0	10 985,3
2013	8 666,5	932,0	1 809,0	120,8	28,4	0,7	11 557,4
2014	9 184,5	971,2	1 864,3	124,1	28,8	0,5	12 173,5
2015	9 739,6	1 012,9	1 927,1	127,3	29,4	0,3	12 836,6
2020	13 026,1	1 226,0	2 244,9	144,0	32,4	0,0	16 673,4
2025	17 167,5	1 384,7	2 628,9	161,6	35,7	0,0	21 378,5
2030	21 546,5	1 502,4	3 090,7	181,1	39,5	0,0	26 360,2
2035	25 993,9	1 770,6	3 657,1	200,8	43,4	0,0	31 665,8
2040	31 567,6	2 191,1	4 327,8	218,0	47,2	0,0	38 351,6
2045	38 716,6	2 547,2	5 077,6	229,7	50,9	0,0	46 622,0
2050	46 918,4	2 916,4	5 893,4	234,3	55,5	0,0	56 018,0
2055	57 178,9	3 406,3	6 795,1	232,4	61,2	0,0	67 674,0

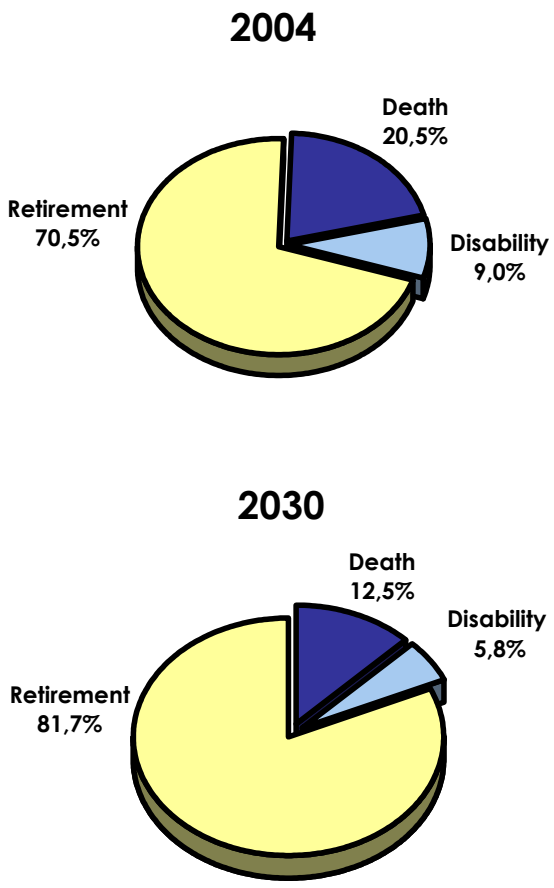
Table 6
Projection of benefits
(in millions of constant dollars)

YEAR	RETIREMENT PENSION	DISABILITY PENSION	SURVIVING SPOUSE'S PENSION	DEATH BENEFIT	ORHAN'S PENSION AND PENSION FOR A DISABLED PERSON'S CHILD	REFUNDS TO SOCIAL ASSISTANCE	TOTAL BENEFITS
2004	5 319,8	670,4	1 433,9	94,2	26,3	3,3	7 547,8
2005	5 496,9	680,5	1 451,5	95,2	26,2	3,0	7 753,3
2006	5 687,0	691,1	1 460,9	96,1	26,0	2,7	7 963,7
2007	5 888,9	698,5	1 465,9	96,9	25,7	2,4	8 178,4
2008	6 099,1	707,4	1 470,7	97,7	25,3	2,0	8 402,2
2009	6 317,7	722,0	1 481,4	98,6	24,9	1,7	8 646,4
2010	6 544,8	738,8	1 494,1	99,5	24,6	1,4	8 903,2
2011	6 778,9	753,8	1 502,8	100,3	24,3	1,1	9 161,3
2012	7 019,4	767,5	1 509,4	100,9	24,1	0,8	9 422,1
2013	7 266,1	781,4	1 516,7	101,3	23,8	0,6	9 689,9
2014	7 519,9	795,2	1 526,4	101,6	23,6	0,4	9 967,2
2015	7 779,9	809,1	1 539,3	101,7	23,5	0,2	10 253,8
2020	9 196,7	865,6	1 585,0	101,6	22,9	0,0	11 771,7
2025	10 712,8	864,1	1 640,5	100,9	22,3	0,0	13 340,5
2030	11 883,8	828,6	1 704,7	99,9	21,8	0,0	14 538,7
2035	12 671,5	863,1	1 782,7	97,9	21,2	0,0	15 436,5
2040	13 601,3	944,1	1 864,7	93,9	20,3	0,0	16 524,3
2045	14 744,0	970,0	1 933,7	87,5	19,4	0,0	17 754,6
2050	15 792,2	981,6	1 983,6	78,9	18,7	0,0	18 855,0
2055	17 010,5	1 013,4	2 021,5	69,1	18,2	0,0	20 132,7

Chart 4 illustrates the distribution of benefits in 2004 and in 2030 according to each of the Plan areas of protection: retirement pension, disability benefits and survivors' benefits.

The increasing proportion of the retirement pension, which rises from 70,5% to 81,7% of total benefits in 2030, well reflects the Plan's greater maturity and the aging of the population. Thereafter, the proportion of each type of benefit remains relatively stable.

Chart 4
Benefit amounts expressed as a percentage of total benefits (according to the event giving entitlement to a benefit)



5.3 The reserve

The reserve constitutes the Plan's net assets, that is, the accumulated difference between cash inflows and outflows since the Plan's inception. Its main purpose is to ensure the stability of the contribution rate.

Tables 7 and 8 show, respectively, in current dollars and in 2004 constant dollars, the cash inflows and outflows and the reserve for the period from 2004 to 2055.

Table 7
Projection of the reserve
(in millions of current dollars)

	CASH INFLOWS			CASH OUTFLOWS			RESERVE		
YEAR	CONTRI-BUTIONS	INVESTMENT INCOME	TOTAL	BENEFITS	ADMINIS-TRATION COSTS	TOTAL		AS A PROPORTION OF CASH OUTFLOWS FOR THE FOLLOWING YEAR	PAY-AS-YOU-GO CONTRIBU-TION RATE
	$	$	$	$	$	$	$		%
2004	8 303	1 165	9 467	7 548	90	7 638	21 277	2,7	9,1
2005	8 587	1 374	9 961	7 870	101	7 970	23 268	2,8	9,2
2006	8 916	1 544	10 460	8 229	113	8 342	25 385	2,9	9,3
2007	9 277	1 730	11 007	8 611	120	8 731	27 661	3,0	9,3
2008	9 655	1 908	11 563	9 024	122	9 146	30 078	3,1	9,4
2009	10 044	2 099	12 142	9 472	129	9 600	32 620	3,2	9,5
2010	10 470	2 306	12 776	9 948	134	10 082	35 314	3,3	9,5
2011	10 902	2 528	13 431	10 451	140	10 591	38 153	3,4	9,6
2012	11 363	2 766	14 129	10 985	146	11 131	41 151	3,5	9,7
2013	11 853	3 022	14 875	11 557	153	11 710	44 316	3,6	9,8
2014	12 358	3 294	15 652	12 173	161	12 334	47 634	3,7	9,9
2015	12 862	3 535	16 397	12 837	167	13 004	51 027	3,7	10,0
2020	15 643	4 689	20 332	16 673	206	16 880	68 458	3,9	10,7
2025	18 609	5 669	24 278	21 378	236	21 614	83 662	3,7	11,5
2030	22 175	6 469	28 644	26 360	267	26 627	94 903	3,4	11,9
2035	26 632	7 122	33 754	31 666	312	31 978	104 234	3,1	11,9
2040	32 011	7 623	39 634	38 352	382	38 733	111 020	2,8	12,0
2045	38 194	7 595	45 788	46 622	432	47 054	109 428	2,2	12,2
2050	45 426	6 667	52 094	56 018	505	56 523	94 247	1,6	12,3
2055	53 942	4 270	58 213	67 674	578	68 252	56 421	0,8	12,5

The initial reserve was 19,4 billion $ as at 31 December 2003, that is, 2,5 times the cash outflows in 2004. The reserve will increase rapidly from 2004 to 2014 and at a slower pace thereafter.

In current dollars, the reserve will reach a maximum of 112 billion $ in 2042 and decline thereafter to 56 billion $ in 2055. In 2004 constant dollars, the reserve will be 17 billion $ in 2055.

Table 8
Projection of the reserve
(in millions of constant dollars)

	CASH INFLOWS			CASH OUTFLOWS				
YEAR	CONTRI-BUTIONS	INVESTMENT INCOME	TOTAL	BENEFITS	ADMINIS-TRATION COSTS	TOTAL	RESERVE*	PAY-AS-YOU-GO CONTRIBU-TION RATE
	$	$	$	$	$	$	$	%
2004	8 303	1 165	9 467	7 548	90	7 638	21 277	9,1
2005	8 460	1 353	9 813	7 753	99	7 852	22 924	9,2
2006	8 629	1 494	10 123	7 964	110	8 073	24 568	9,3
2007	8 811	1 643	10 454	8 178	114	8 292	26 272	9,3
2008	8 990	1 777	10 767	8 402	114	8 516	28 007	9,4
2009	9 169	1 916	11 084	8 646	118	8 764	29 778	9,5
2010	9 371	2 064	11 434	8 903	120	9 023	31 605	9,5
2011	9 557	2 216	11 773	9 161	123	9 284	33 444	9,6
2012	9 746	2 373	12 119	9 422	125	9 547	35 295	9,7
2013	9 938	2 533	12 471	9 690	128	9 818	37 155	9,8
2014	10 119	2 697	12 816	9 967	132	10 099	39 001	9,9
2015	10 274	2 824	13 098	10 254	134	10 388	40 760	10,0
2020	11 044	3 310	14 355	11 772	146	11 917	48 333	10,7
2025	11 612	3 538	15 150	13 341	147	13 488	52 206	11,5
2030	12 230	3 568	15 798	14 539	147	14 686	52 343	11,9
2035	12 983	3 472	16 455	15 436	152	15 589	50 812	11,9
2040	13 792	3 284	17 077	16 524	164	16 689	47 834	12,0
2045	14 545	2 892	17 437	17 755	165	17 919	41 672	12,2
2050	15 290	2 244	17 534	18 855	170	19 025	31 722	12,3
2055	16 048	1 270	17 318	20 133	172	20 305	16 785	12,5

* After conversion into constant dollars, the reserve for a given year is no longer exactly equal to the reserve of the previous year plus the net total of the current year's cash inflows and outflows.

Table 9 provides more details about changes to the operating balance, which is the surplus of contributions after benefits and administration costs are deducted. It also shows net cash inflows, that is, the operating balance to which is added investment income and the use of investment income and the reserve to fund cash outflows.

Table 9
Funding sources for cash outflows
(in millions of current dollars)

YEAR	CASH OUTFLOWS (1)	CONTRIBUTIONS (2)	OPERATING BALANCE (2) – (1)	INVESTMENT INCOME (3)	NET CASH INFLOWS (2) – (1) + (3)	PERCENTAGE OF INVESTMENT INCOME USED	PERCENTAGE OF RESERVE USED	RESERVE
	$	$	$	$	$	%	%	$
2003								19 448
2004	7 638	8 303	665	1 165	1 830	0	0	21 277
2005	7 970	8 587	617	1 374	1 990	0	0	23 268
2006	8 342	8 916	574	1 544	2 117	0	0	25 385
2007	8 731	9 277	546	1 730	2 276	0	0	27 661
2008	9 146	9 655	509	1 908	2 417	0	0	30 078
2009	9 600	10 044	443	2 099	2 542	0	0	32 620
2010	10 082	10 470	388	2 306	2 694	0	0	35 314
2011	10 591	10 902	311	2 528	2 839	0	0	38 153
2012	11 131	11 363	232	2 766	2 998	0	0	41 151
2013	11 710	11 853	143	3 022	3 165	0	0	44 316
2014	12 334	12 358	24	3 294	3 318	0	0	47 634
2015	13 004	12 862	-142	3 535	3 393	4	0	51 027
2020	16 880	15 643	-1 236	4 689	3 452	26	0	68 458
2025	21 614	18 609	-3 005	5 669	2 664	53	0	83 662
2030	26 627	22 175	-4 452	6 469	2 017	69	0	94 903
2035	31 978	26 632	-5 345	7 122	1 776	75	0	104 234
2040	38 733	32 011	-6 722	7 623	901	88	0	111 020
2045	47 054	38 194	-8 860	7 595	-1 266	100	1	109 428
2050	56 523	45 426	-11 097	6 667	-4 429	100	5	94 247
2055	68 252	53 942	-14 310	4 270	-10 039	100	15	56 421

The following conclusions can be drawn from Table 9:

- During the period 2004 to 2014, contributions are higher than cash outflows, which will result in a rapid accumulation of reserve funds.
- Between 2015 and 2042, investment income is increasingly used to offset the shortfall between contributions and cash outflows. For example, in 2023, investment income represents a maximum of 23% of cash inflows, which clearly illustrates the role of the reserve as a source of income for the Plan during this period.
- As of 2043, contributions and investment income are not sufficient to fund cash outflows, causing the reserve to decrease. The rate at which the reserve declines during this period suggests a depletion of the reserve a few years after the end of the projection period.

Chart 5 shows, for each year from 1990 to 2055, the amount of contributions and investment income as well as the extent of cash outflows (benefits and administration costs).

Chart 5
The Plan's cash inflows and outflows
(in millions of constant dollars)

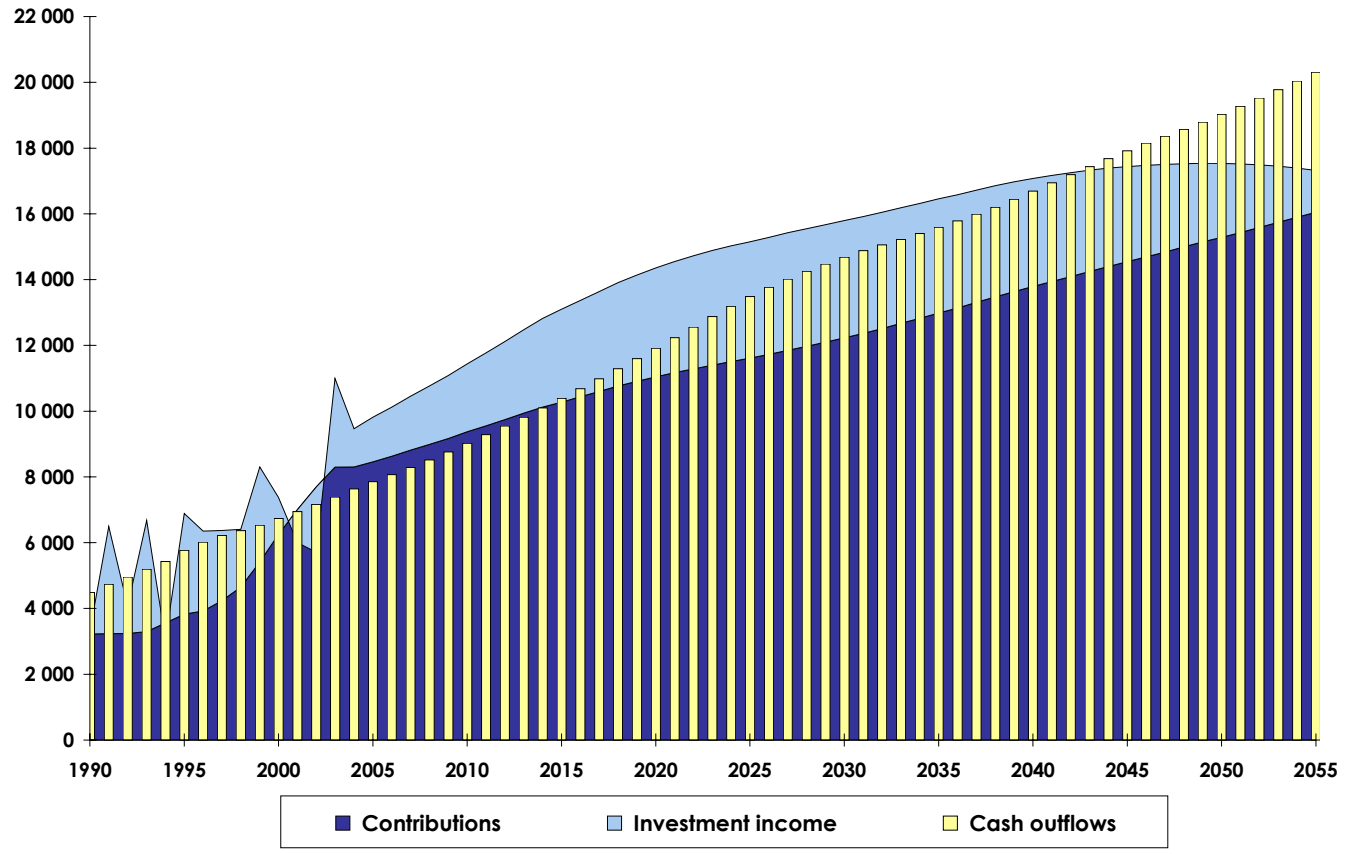
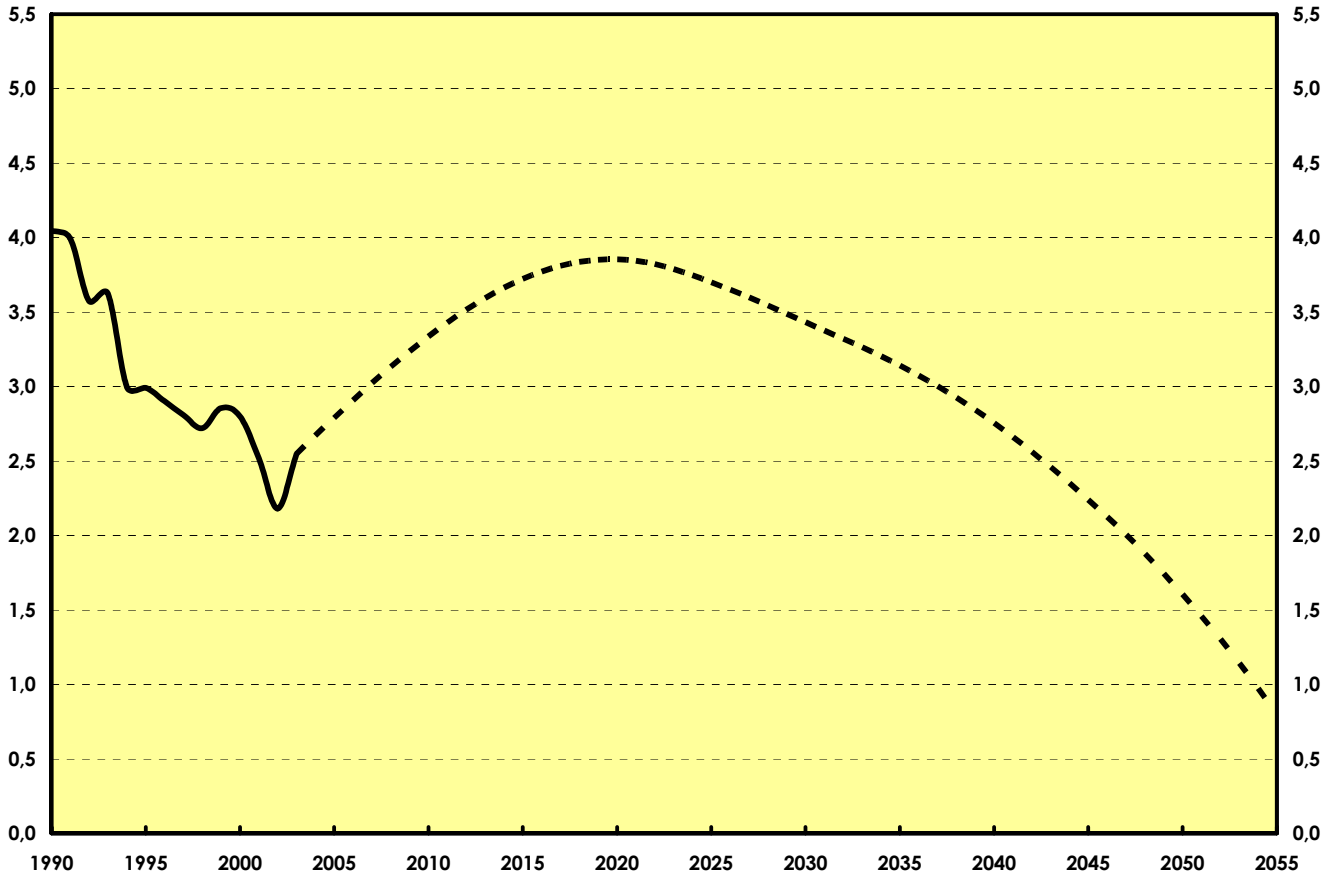


Chart 6

Changes in the ratio of the reserve at the end of each year to cash outflows of the following year



The comparison between the reserve at the end of a year and cash outflows for the following year makes it possible to measure the relative size of the reserve. From a ratio of 4,0 in 1990, to 2,7 in 2004, then rising to 3,9 in 2020 and then dropping back to 0,8 in 2055. Chart 6 illustrates these changes.

The decrease as of 2020 follows the rapid increase in cash outflows that result from the arrival of a large number of retirees during the period from 2010 to 2030.

5.4 Other results

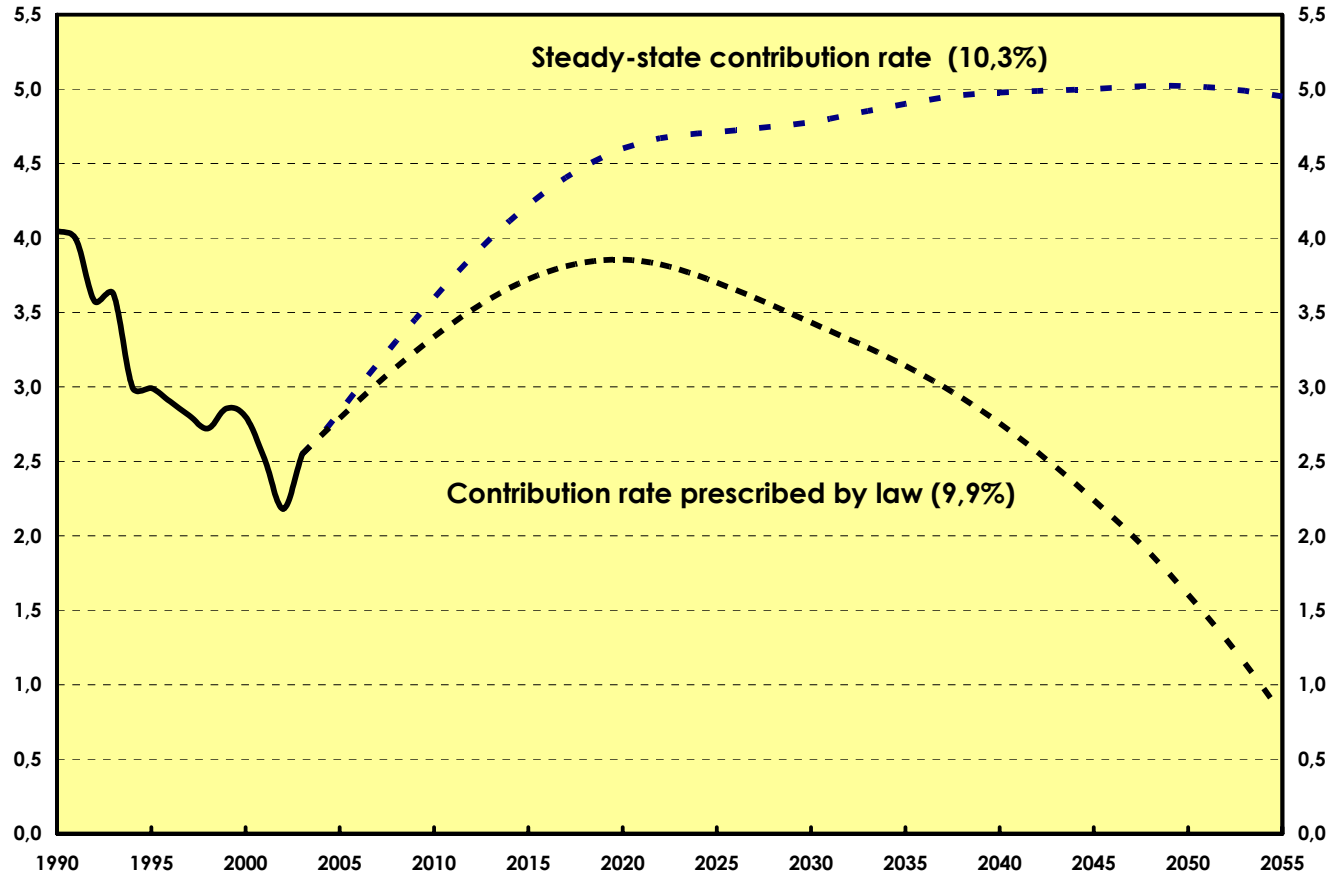
5.4.1 Steady-state contribution rate

As indicated in section 2, the steady-state contribution rate is an indicator of the Plan's funding stability. It is the contribution rate that would allow stabilizing the ratio of the reserve to cash outflows in the final years of the projection period.

Since the number of retirees is relatively stable from 2040, the reference period for establishing the balanced rate begins at this date and terminates at the end of the projection period in 2055.

The steady-state contribution rate that will enable the ratio of the reserve to cash outflows to remain stable between 2040 and 2055 is 10,3%, a difference of 0,4 percentage point compared to the contribution rate established by the *Act respecting the Québec Pension Plan*.

Chart 7
Changes in the ratio of the reserve at the end of one year to cash outflows for the following year, based on the contribution rate



As Chart 7 illustrates, if this rate were applied,[6] the reserve would increase rapidly to amount to 4,6 times the annual cash outflows in 2020, and would progress slowly thereafter to amount to approximately 5,0 times the annual cash outflows as of 2040. The detailed results of the projection of the reserve are presented in Appendix IV.

For purposes of comparison, the steady-state contribution rate, based on data and assumptions from the previous actuarial report, is 10,1%. The increase of this rate from 10,1% to 10,3% is explained briefly in section 5.4.5 and in detail in Appendix VI.

A difference of 0,4 percentage point compared to the contribution rate of 9,9% is higher than the tolerance zone of 0,3 percentage point detailed in section 2. Consequently, the ratio of the reserve to annual cash outflows is below 2,0, as of 2048.

5.4.2 Pay-as-you-go contribution rate

Changes in funding for the Plan can also be measured using the pay-as-you-go contribution rate. This rate is calculated by dividing cash outflows for one year by the contributory payroll during the same year. It helps to illustrate what would be required of contributors to fund cash outflows if there were no reserve.

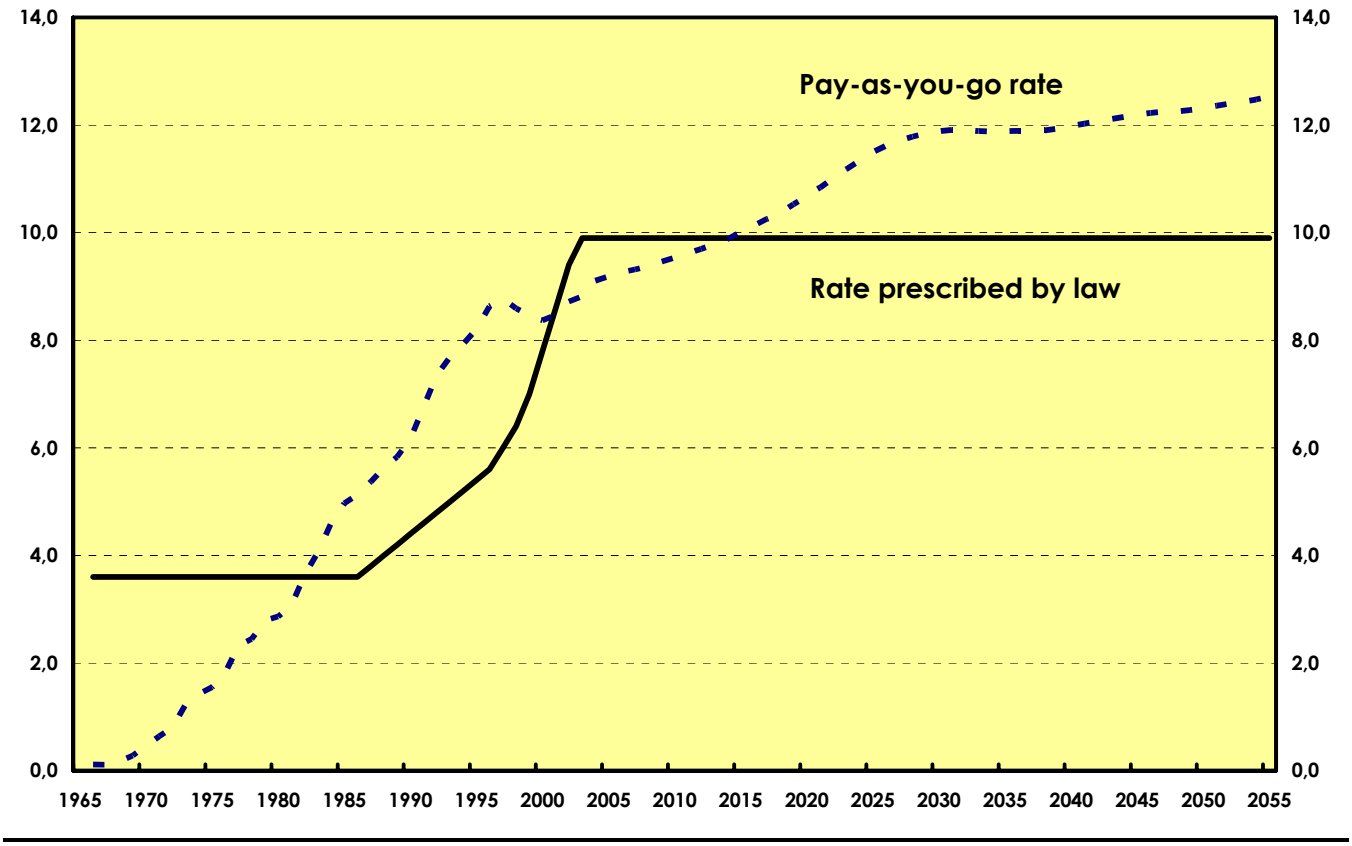
Chart 8 shows changes to the pay-as-you-go contribution rate and the contribution rate prescribed by legislation between 1966 and 2055. It helps to illustrate the effect the adopted method of funding would have on the contribution rate, compared with a pure pay-as-you-go funding scheme. It also shows the role of the reserve and the investment income it generates. The positive difference between these two curves, from 2001 to 2014, combined with the investment income generated by the accumulated reserve enables the funding of cash outflows beginning in 2015, the year the pay-as-you-go rate exceeds the rate of 9,9% prescribed by law. It will reach 12,5% in 2055.

Table 12 of Appendix I shows detailed data for the period of 1966 to 2003 and Tables 7 and 8 in section 5.3 show the projection of the pay-as-you-go rate from 2004 to 2055.

6. In this simulation, the steady-state contribution rate is applied beginning in 2005.

Chart 8

Pay-as-you-go contribution rate and the rate prescribed by law
(in percentage)



5.4.3 Active life to retirement ratio

Changes in activity rates and life expectancy have significantly changed the ratio between the number of retirement years and number of work years.

For a given age of retirement from the labour market, the increase in life expectancy results in an increase in the retirement period. A decrease in the age of retirement from the labour market produces a decline in the period of an active life and increases the retirement period.

Since 1985, the average age of retirement from the labour market has declined 1,4 years for men and 2,0 for women, which is respectively age 61,3 and 60,8 in 2000. Over the same period, the life expectancy calculated at the average age of retirement has increased significantly.

The active life to retirement ratio has therefore declined rapidly, so that it is currently 2,1 for men and 1,7 for women (for generations reaching 65 in 2000). In other words, men currently enjoy one year of retirement for each two-year period spent on the labour market. For women, the ratio is smaller because they tend to retire earlier than men and have a higher life expectancy.

In this report, a continued increase in life expectancy is projected. If the average age of retirement from the work force remained unchanged between now and 2055, men would spend 4,4 more years in retirement. The ratio between the number of years worked and number of retirement years would therefore decline to 1,7 instead of 2,1. Under the same conditions, women would spend 3,5 years more in retirement, which would bring down the active life to retirement ratio to 1,5 instead of 1,7.

These ratios, however, will likely not be achieved because increased activity rates are anticipated in the years to come, for five-year age groups between ages 25 and 64. For men, higher activity rates would produce a progressive increase in the average age of retirement from the labour force throughout the projection period. For women, this increase will manifest itself only when the first generations of baby boomers reach retirement age. Between now and 2055, the anticipated increase in activity rates lengthens the period of work by 1,9 years on average for men and 2,4 for women, compared to 2000.

Table 10 presents, for different cohorts, the number of economically active years,[7] the number of years spent in retirement[8] and the ratio between these two numbers. Appendix III specifies the method used to calculate these figures.

Based on the assumptions made, the following results are obtained:

- The active life to retirement ratio for men falls slightly between 2000 and 2055. During this period, life expectancy increases 4,7 years, broken down in the following manner: 2,8 years of retirement and 1,9 year of participation in the labour market.
- The active life to retirement ratio for women continues to narrow until 2010. Thereafter, it increases slightly. Between 2000 and 2055, life expectancy grows 3,8 years, broken down in the following manner: 1,4 years of retirement and 2,4 years of participation in the labour market.

Table 10
Changes in the active life to retirement ratio

YEAR*	YEARS OF ACTIVE LIFE (1)	YEARS OF RETIREMENT (2)	ACTIVE LIFE TO RETIREMENT RATIO (1) / (2)
		MEN	
2000	41,3	19,6	2,1
2005	41,7	19,9	2,1
2010	41,9	20,6	2,0
2015	42,2	20,7	2,0
2025	42,2	21,4	2,0
2035	42,6	21,7	2,0
2045	42,9	22,1	1,9
2055	43,2	22,4	1,9
		WOMEN	
2000	40,8	24,4	1,7
2005	40,5	24,8	1,6
2010	40,4	25,5	1,6
2015	41,3	25,0	1,7
2025	41,5	25,5	1,6
2035	42,5	25,2	1,7
2045	42,8	25,5	1,7
2055	43,2	25,8	1,7

* For each year, the above results pertain to the 63-67 age group population. This population is therefore age 65 on average in the year indicated.

7. Assuming the age of entry into the labour market is 20.
8. This is the life expectancy at the average retirement age, based on projections used in this report.

- On the whole, current active life to retirement ratios remain relatively stable during the projection period. It is therefore anticipated that workers will adjust their age of retirement from the labour market so that the balance between the number of working years and number of retirement years remains relatively constant.

5.4.4 Sensitivity tests on the results

Tests were made to measure the sensitivity of the results to changes in the demographic assumptions described in section 4.1 and economic assumptions described in section 4.2. For each change in assumption, the ratio of the reserve for a given year to cash outflows for the following year were calculated for each of the years in the projection period, based on statutory provisions for benefits and the contribution rate of 9,9%. The steady-state contribution rate was determined for each change in assumptions. The results are shown in Appendix V.

Generally speaking, the sensitivity tests show that the level of the reserve is sensitive to the actuarial assumptions used. Since the projections must cover a long period, any recurrent variation in the difference between cash inflows and outflows may have a non-negligible effect on the accumulated reserve in 2055. The sensitivity tests show, however, that it usually only takes a slight adjustment in the contribution rate over a long period to completely reverse the long-term impact of such variations on the reserve.

Tests show that the Plan's future funding situation is particularly sensitive to the assumptions regarding the increase in employment earnings, the reduction in mortality rates and investment yields.

For example, the assumption regarding investment yields was the subject of two sensitivity tests. Results show the impact an upward or downward 0,5 percentage point change in the actual yield rate would have on the entire projection period.

This type of decline in the yield rate would result in a depletion of the reserve in 2052. The steady-state contribution rate would therefore be 10,5% instead of 10,3%.

Inversely, an equivalent increase in the yield rate would raise the ratio between the reserve and cash outflows for the following year from 0,8 to 2,8 in 2055. This would result in a steady-state contribution rate of 10,1%.

5.4.5 Comparison and reconciliation with the previous actuarial report

Appendix VI shows the differences observed between the actual operating results and projections in the previous report for 2001, 2002 and 2003. Smaller than projected returns on investment and a higher increase than anticipated in the number of recipients of disability and retirement pensions are the main points covered in this section.

Furthermore, from a more prospective point of view, the results of this report are compared and reconciled with those of the actuarial report as at 31 December 2000. The steady-state contribution rate of 10,3% is higher than the rate of 10,1% calculated on the basis of the results of the previous actuarial analysis. This difference is attributable primarily to the negative return on reserve investments in 2001 and 2002 and an upward adjustment in the life expectancy of beneficiaries.

6. Conclusion

This actuarial report shows that the contribution rate of 9,9% that is prescribed in the *Act respecting the Québec Pension Plan*, is sufficient to pay future benefits until 2055. In spite of the substantial increase in benefits paid, resulting from the aging of the population, the Plan will be able to meet its commitments throughout the projection period.

The 9,9% contribution rate, however, does not ensure stable funding of the Plan over the long term. In fact, the projection shows an eventual depletion of the reserve. If no change to contributions and benefits is introduced before then, this depletion will require future generations to assume a contribution rate of approximately 12,5% beyond 2055, that is, the pay-as-you-go rate.

As at 31 December 2003, the reserve represents 2,5 times the cash outflows of the following year. Based on the assumptions used for this report, contributions are greater than cash outflows between 2004 and 2014, which will make it possible to rapidly increase the reserve. As of 2015, investment income from the reserve will be used to fund the expected cash outflows, after all contribution income has been applied.

In 2020, the reserve will reach a level of 3,9 times the cash outflows of the following year. Thereafter, due primarily to the growing number of retirees, this ratio will decrease because the reserve increases less rapidly than the cash outflows. Investment income will be used to bridge the gap between income from contributions and cash outflows until 2042.

At that time, the investment income added to contributions becomes insufficient to fund cash outflows, and therefore the reserve begins to gradually decline. Beginning in 2043, these withdrawals from the reserve accelerate the narrowing of the ratio between the reserve and cash outflows. At the end of the projection period, the reserve falls to 0,8 times the annual cash outflows.

The steady-state contribution rate, that is, the rate that would ensure the long-term stability of the ratio between the reserve and cash outflows, is 10,3%. The rate is higher than the 10,1% calculated on the basis of the results from the previous actuarial report. This difference is attributable in large part to a negative return on reserve investments in 2001 and 2002 and an upward adjustment in life expectancy of beneficiaries.

For the first time since the 1998 reform, the projected reserve therefore drops below the minimum level, that is, twice the annual cash outflows, before the end of the projection period. Furthermore, the difference between the steady-state contribution rate and the prescribed contribution rate of 9,9% is greater than 0,3 percentage point. The results of this analysis therefore constitute a signal of possible future changes to the Plan, given its funding situation.

A public consultation on the Plan's situation and on the opportunity to make changes to the Plan was held in early 2004. The results of this report will help to guide the government in its decisions regarding such changes.

In accordance with section 217 of the *Act respecting the Québec Pension Plan*, when a bill regarding these changes is tabled in the National Assembly, a follow-up actuarial report will be prepared to indicate how the bill will affect the projections in this report.

In addition to public consultations scheduled every six years, monitoring the Plan's funding situation is also ensured by periodic actuarial analyses. Since the results of long-term projections involve some degree of uncertainty, it is necessary to review them at least once every three years. The next general actuarial analysis is expected to be made as at 31 December 2006.

7. Attestation

In our opinion, this actuarial report:

- is based on data that are sufficient and reliable;
- uses reasonable and appropriate assumptions; and
- is based on methods that are relevant and in accordance with generally accepted actuarial principles.

Furthermore, this report was also prepared in accordance with the general standards of practice of the Canadian Institute of Actuaries and Guidelines of Actuarial Practice for Social Security Programs of the International Actuarial Association.

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Appendix

Review of Plan funding

1. Changes in Plan funding

This appendix explains the Plan's funding method, focusing on the background and principal reasons that have brought about funding changes since the Plan's inception.

When the Plan began, in 1966, the government adopted a partially funded approach , which is between a pure pay-as-you-go funding scheme[9] and full capital funding.[10] This method of funding was recommended in 1964 by the Interministerial Committee of the Québec Pension Plan because of the public nature of the Plan. The assurance that contributions would always be paid by Québec workers through the Government's taxation power guaranteed the public plan's continuity and made it unnecessary to have full funding.

Moreover, the Committee alerted the Government against a pure pay-as-you-go scheme because of the foreseeable long-term risk of increases in the contribution rate that are inherent in that type of plan and the detrimental consequences for the Government that could occur in a difficult economic juncture. The mixed funding scheme proposed by the Committee was aimed at constituting a contingency reserve equal to only a few years of benefits so as to protect the Plan against economic fluctuations.

The Committee recommended a contribution rate of 4%, that is, a rate higher than would have been needed for a pure pay-as-you-go plan and higher than the 2% rate proposed for the implementation of the Canada Pension Plan. The Québec and federal governments wanted the two plans to be similar with respect to contributions and the main benefits since the totality of Canadian workers would be covered and thus, a significant number of workers would participate in both plans during their working lives. The establishment of an initial contribution rate of 3,6% was a compromise reached by the two governments.

It was clear from the Plan's inception that the initial rate of 3,6% would have to be raised later. However, changes in the Plan's demographic and economic environment as well as amendments to the Plan's provisions created additional upward pressure on the contribution rate. In those circumstances, two sequences of increase in the contribution rate had to be scheduled.

From 1966 to 1970, net cash inflows during the Plan's inception period and an economic juncture that was more favourable than initially anticipated resulted in the constitution of a relatively large reserve. The 1970 actuarial report points out the Plan's favourable course in the preceding years but still forecasts a fully depleted reserve in 2007, a sign of inadequate long-term funding.

The following decade was marked by several increases in benefits, including the following:

9. In a pure pay-as-you-go funding scheme, the contributions of a given year are used to pay the benefits of the same year.
10. In a fully funded plan, the aggregate contributions made throughout the active life of a group of workers are used to pay all of that group's benefits.

- the maximum pensionable earnings adjustment of 12,5% per year, from 1976 to 1987 although initially MPE growth was expected to be only 2% a year;
- full indexation of benefits as of 1974 with an adjustment to offset the effects of the ceiling between 1966 and 1973;
- exclusion from the contributory period of the months for which a person received a family allowance for a child under the age of 7, if those months fall within a year in which the person's employment earnings were less than his or her average pensionable earnings. This measure was implemented in 1977 and was retroactive;
- an increase in the fixed-benefit portion of the surviving spouse's pension and the disability pension, as of January 1973. That portion increased from 27,60 $ to 80,00 $ a month;
- the retirement pension is no longer reduced on the basis of earnings for people aged 65 to 69, as of 1 January 1977.

The changes made after 1970 were the subject of reports indicating to what extent they would modify the most recent Plan estimates. Those reports mentioned that the value of benefits was increasing substantially, complete depletion of the reserve was approaching and the Plan's long-term funding was insufficient.

Between 1966 and 1986, demographic factors also put pressure on contribution rates. A significant drop in the number of births at the end of the 1960s as well as an increase in life expectancy that was greater than projected were reflected in changes in population structure. The funding method and, consequently, the level of the contribution rate were brought into question. The mixed funding method adopted at the Plan's inception was closer to pay-as-you-go funding than to full capital funding. The contribution rate that resulted from this choice, is stable so long as the demographic structure remains stable, that is, so long as the ratio of workers to retirees remains constant. Population aging, which is the result of demographic changes, increased that ratio and made it necessary to change the contribution rate.

Table 11 shows the change in population structure from the Plan's inception to 2055, by giving the percentage of the population aged 65 and over and the ratio of the population aged 20 to 64 to the population aged 65 and over.

Changes in the Plan's economic environment which have been observed since the 1980s, put additional pressure on contribution rates. The funding method adopted at the Plan's inception was compatible with the economic situation observed during the 1960s and 1970s, that is, rapid growth in total payroll and a not-very-high real rate of return on investments.

This situation has reversed itself since the beginning of the 1980s. Consequently, contributions have changed more slowly than expected. Moreover, the low level of capital funding made it impossible to take full advantage of the higher rate of return on investments.

Confronted by insufficient long-term funding for the Plan, it was decided to adjust the contribution rate.

Table 11
Changes in the population structure from 1966 to 2055

YEAR	PERCENTAGE OF THE POPULATION AGED 65 AND OVER	RATIO:	20 TO 64 / 65 AND OVER
1966	6,0		8,4
1970	6,6		8,1
1975	7,4		7,6
1980	8,5		7,0
1985	9,6		6,5
1990	10,8		5,8
1995	11,8		5,3
2000	12,9		4,9
2005	13,8		4,6
2010	15,4		4,1
2015	17,6		3,5
2020	20,1		3,0
2025	22,8		2,5
2030	25,2		2,2
2035	26,0		2,1
2040	26,3		2,1
2045	27,0		2,0
2050	27,4		2,0
2055	27,6		1,9

The first series of increases in the contribution rate occurred in 1986. The federal government, under an agreement with the Canadian provinces, adopted a funding method to ensure that the Canada Pension Plan reserve would not be depleted. This method was intended to maintain a reserve equal to at least twice the cash outflows for the following year throughout the projection period. Thus, the contribution rate rose from 3,6% in 1986 to 5,6% in 1996. The Québec government adopted a similar approach with regard to the Québec Pension Plan by maintaining parity with the Canada Pension Plan contribution rates.

In 1996, the Québec government's working paper entitled *For You and Your Children: Guaranteeing the future of the Québec Pension Plan* showed that the pace of increase in the contribution rate that began in 1986 was not sufficient. According to the actuarial report as at 31 December 1994, the contribution rate would have to reach 13% in the long term to maintain a reserve equal to twice the cash outflows of the following year throughout the projection period. On the one hand, the question of fairness was raised because of the expected sharp increase in the contribution rate. On the other hand, the confidence of contributors and beneficiaries in the Plan's future had been shaken by the spectre of a lack of funds in the near future if the contribution rate was not increased more rapidly.

Those were the circumstances in which the second series of increases in the contribution rate was undertaken. The Québec government, in harmony with the federal government and the governments of the other provinces, decided to bring in the projected increases sooner than scheduled so that it would be possible to avoid having a rate considered to be too high. The reform put into place in 1998 was designed to rapidly increase the contribution rate from 6,0% in 1997 to 9,9% in 2003.

That reform, with its subsequent increase in contribution rates, was aimed at ensuring the Plan's continuation and to improve fairness between generations of contributors. More concretely, the objective sought was to stabilize the contribution rate so that future generations of workers would make contributions on the basis of the same rate for an equivalent level of benefits.

The reform made it possible to increase the Plan's degree of capital funding. The resulting reserve will make it possible to maintain the same contribution rate for a very long period. The contribution rate of 9,9% will spare future generations from having to pay contributions at an estimated

rate of 13% or more, which was the level projected in the actuarial reports made prior to the reform.

The levels of certain benefits were also reduced. These adjustments have also contributed to keeping long-term increases in the contribution rate below what had been forecast prior to the reform and ensure the Plan's sustainability.

2. Changes in the reserve

As additional information, Table 12 shows the history of cash inflows and outflows and the Plan's reserve. The data in the table are calculated from the Plan's financial statements, on the basis of the calendar year and the cash basis of accounting.

Investment income history has been adjusted to ensure uniformity of the calculation over time. This includes income paid to the Régie as well as changes in market value. The administration costs shown in the table include the collection fees paid to the Québec Ministère du Revenu.

Since the values shown are established on the cash basis of accounting, the reserve as at 31 December 2003 and the estimated cash outflows for 2004 differ from the values of the actuarial analysis, which is determined on the accrual basis of accounting. Despite this basic difference, the ratio between the reserve and cash outflows of the following year calculated for 2003 is identical to the ratio for the actuarial analysis, that is, 2,5.

Table 12

Changes in the reserve from 1966 to 2003

(in millions of current dollars)

		CASH INFLOWS			CASH OUTFLOWS			RESERVE		
YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	INVESTMENT INCOME	TOTAL	BENEFITS	ADMINISTRATION COSTS[1]	TOTAL	AS A PROPORTION OF CASH OUTFLOWS FOR THE FOLLOWING YEAR		PAY-AS-YOU-GO CONTRIBUTION RATE
	%	$	$	$	$	$	$	$		%
1966	3,6	188	0	188	–	6	6	182	26,0	0,1
1967	3,6	224	-13	212	0	7	7	386	33,6	0,1
1968	3,6	236	42	278	4	8	12	653	31,2	0,2
1969	3,6	271	-29	241	13	8	21	874	24,1	0,3
1970	3,6	284	145	429	26	10	36	1 266	24,8	0,5
1971	3,6	287	207	494	43	8	51	1 709	24,0	0,6
1972	3,6	321	216	537	61	11	71	2 175	17,6	0,8
1973	3,6	361	71	433	112	12	124	2 484	15,6	1,2
1974	3,6	404	-104	300	145	15	159	2 625	12,8	1,4
1975	3,6	478	284	762	193	12	205	3 181	11,0	1,5
1976	3,6	574	549	1 123	272	19	290	4 014	10,2	1,8
1977	3,6	611	460	1 070	365	29	394	4 691	9,8	2,3
1978	3,6	704	473	1 177	454	24	478	5 390	9,3	2,4
1979	3,6	747	318	1 065	554	25	579	5 876	8,3	2,8
1980	3,6	925	478	1 403	675	30	705	6 575	7,7	2,9
1981	3,6	984	-111	873	818	34	852	6 596	6,3	3,1
1982	3,6	1 053	2 249	3 302	1 007	41	1 048	8 850	7,0	3,6
1983	3,6	1 109	1 371	2 480	1 223	46	1 268	10 062	6,2	4,1
1984	3,6	1 241	1 186	2 427	1 561	50	1 611	10 877	5,7	4,6
1985	3,6	1 357	2 114	3 471	1 847	57	1 904	12 445	5,8	5,0
1986	3,6	1 524	1 679	3 203	2 077	58	2 135	13 513	5,6	5,1
1987	3,8	1 737	618	2 355	2 338	65	2 404	13 465	5,0	5,4
1988	4,0	1 913	1 354	3 267	2 623	60	2 683	14 049	4,8	5,6
1989	4,2	2 107	2 204	4 311	2 887	68	2 955	15 405	4,7	5,8
1990	4,4	2 336	58	2 394	3 177	73	3 250	14 549	4,0	6,2
1991	4,6	2 451	2 477	4 928	3 518	78	3 596	15 882	4,0	6,8
1992	4,8	2 601	665	3 266	3 899	78	3 977	15 170	3,6	7,3
1993	5,0	2 694	2 762	5 456	4 165	80	4 244	16 381	3,6	7,7
1994	5,2	2 963	-425	2 538	4 438	82	4 519	14 400	3,0	7,9
1995	5,4	3 187	2 551	5 738	4 721	87	4 807	15 330	3,0	8,2
1996	5,6	3 341	2 071	5 412	5 038	86	5 124	15 619	2,9	8,6
1997	6,0	3 666	1 842	5 508	5 292	88	5 381	15 746	2,8	8,8
1998	6,4	4 099	1 551	5 649	5 531	74	5 605	15 790	2,7	8,6
1999	7,0	4 810	2 572	7 381	5 737	69	5 806	17 365	2,9	8,5
2000	7,8	5 653	1 008	6 661	6 008	74	6 082	17 944	2,8	8,4
2001	8,6	6 500	-928	5 572	6 331	77	6 409	17 108	2,5	8,5
2002	9,4	7 119	-1 891	5 228	6 715	78	6 793	15 543	2,2	8,7
2003	9,9	7 667	2 607	10 274	7 031	86	7 117	18 704	2,5	8,8

1. Prior to 1998, expenses related to accounts receivable on contributions are included in the collection fees. Since 1998, a portion has been deducted from contributions and another portion from investment income.

Appendix II

Summary of the main provisions of the *Act respecting the Québec Pension Plan*

1. Date of Plan's inception

1 January 1966

2. Significant amendments to the *Act* since the last actuarial report

The *Act to amend the Québec Pension Plan and other legislative provisions* brought in the right of same sex spouses to receive a surviving spouse's benefit following the death of a spouse that had occurred between 4 April 1985 and 16 June 1999, and for which an application for benefits was filed with the Régie as of March 2002.

3. Definitions

a) Maximum pensionable earnings (MPE)

Upper limit beyond which a worker's pensionable employment earnings are not subject to Plan contributions. Earnings that exceed the MPE are not used to calculate pensions. The MPE of a given year is equal to the MPE of the preceding year multiplied by the ratio between the average weekly wage in Canada established by Statistics Canada for two consecutive 12-month periods ending on 30 June. The amount is rounded down to the hundredth dollar. In 2004, it is 40 500 $.

b) Basic exemption

Lower limit below which a person's employment earnings for a given year were not subject to Plan contributions. From 1975 to 1998, the limit was 10% of the MPE. Since 1998, the basic exemption is set at 3 500 $.

c) Contributory period

Reference period beginning on a person's 18th birthday or on 1 January 1966 if the person was already 18 years old on that date. The contributory period ends on the earliest of the following dates: death, 70th birthday or on the date as of which payment of a retirement pension under the Plan begins, whichever event occurs first.

Certain periods are excluded from the contributory period; they include the three months preceding the beginning of a disability payment and all the months in which a person is entitled to a disability pension under the Plan; all the months for which a family allowance was paid for a child under the age of 7, provided those months fall within a year in which the person's employment earnings were less than the basic exemption; and certain months for which an unreduced salary replacement indemnity was paid pursuant to the *Act respecting industrial accidents and occupational diseases*.

d) Pension index

Cumulative index representing the average Consumer Price Index for Canada for the period of 12 months ending on 31 October of the year that precedes the year in which the index is established.

4. Contribution to the Plan

Subject to certain exceptions, every person 18 years of age or older who receives employment earnings for work done in Québec must contribute to the Plan if his or her earnings are greater than the basic exemption, unless he or she is receiving a disability pension under the Québec Pension Plan or a similar plan.

The beneficiaries of a retirement pension who work must contribute to the Plan just like all other workers.

Contribution to the Plan is determined by applying the contributory rate to the portion of employment earnings included between the basic exemption and the MPE. From 1966 to 1986, the rate was 3,6%. From 1987 to 1996 it rose 0,2% a year, reaching 5,6% in 1996 and in 1997, it was raised to 6,0%. In accordance with the Plan's reform, the contribution rate increased to 6,4% in 1998, to 7,0% in 1999, to 7,8% in 2000, to 8,6% in 2001 and to 9,4% in 2002. In 2003 and for subsequent years, the contribution rate has been set at 9,9%.

The rate is divided equally between the worker and his or her employer. A self-employed worker must pay the entire contribution.

5. Retirement pension

a) Eligibility

The retirement pension is paid for life to a person aged 60 years or over who contributed to the Plan and who makes an application. Every application for a retirement pension from a person whose age is between 60 and 64 must be accompanied with a declaration of cessation of work or participation in a phased retirement program. Between the ages of 60 to 64, a person is deemed to have stopped working if his or her employment income calculated on an annual basis is less than 25% of the MPE. If a person has not stopped working, he or she can still receive a retirement pension if he or she participates in a phased retirement program, that is, if his or her pay has been reduced by at least 20% as the result of an agreement with his or her employer to reduce the number of hours worked.

b) Amount of the pension

The initial monthly amount of the retirement pension paid to a person is equal to 25% of the average MPE for the last 5 years, that is, for the year of retirement and the preceding 4 years. The average MPE is adjusted so as to take the following into account:

- a person's pensionable earnings in relation to the MPE during his or her contributory period;
- his or her period of participation in the Plan in relation to his or her contributory period (up to 15% of the months in which earnings were low or nil can be excluded from the contributory period; moreover, the months for which family allowances were paid to the contributor for a child under age 7 can be excluded if it is to the contributor's advantage);
- the number of months included between the date of retirement and his or her 65th birthday. The amount of the pension is decreased or increased by 0,5% a month, respectively, according as the person's age at retirement is under or over 65. Beneficiaries of a disability pension who are declared to be disabled after 1998 and who reach age 65 receive a retirement pension that is reduced by an adjustment of 0,5% a month for each month for which a disability pension was paid between the ages of 60 and 65.

c) Recalculation of the retirement pension of a retiree who works

A working retiree whose annual employment earnings are greater than the basic exemption must contribute to the Plan. In return, his or her retirement pension may, in some cases, be increased. The increase results from substituting his or her new earnings for a year in his or her contributory period for which lower earnings had been recorded.

d) Pension retroactivity after age 65

An applicant over age 65 is entitled to a retroactive retirement pension. The period of retroactivity can reach a maximum of 60 months but may not include any months in the period prior to his or her 65th birthday.

6. Disability benefits

a) Eligibility

Under the *Act respecting the Québec Pension Plan*, a person is disabled if he or she has a severe and prolonged physical or mental disability. A disability is severe if it makes the person unable to regularly do any type of substantially gainful work. It is prolonged if it will result in death or be permanent. If a person is between the ages of 60 and 65 and not totally disabled, he or she is entitled to a disability pension if his or her impairment makes him or her unable to do his or her usual work.

A person may be entitled to a disability pension if he or she contributed to the Plan for one of the following periods:

- 2 of the last 3 years in his or her contributory period;
- 5 of the last 10 years in the contributory period;
- at least half of the years in the contributory period, but not less than 2 years.

A disability pension is not paid to anyone who, after 31 December 1985, becomes the beneficiary of an unreduced income replacement indemnity paid pursuant to the *Act respecting industrial accidents and occupational diseases*.

b) Calculation of the pension

The initial monthly disability pension is comprised of a fixed portion (382,14 $ in 2004) and a variable portion equal to 75% of the accumulated retirement pension.

c) Cessation of payment

Payment of a disability pension stops on the date on which a person ceases to be disabled or no later than his or her 65th birthday.

d) Pension for a disabled person's child

A fixed monthly benefit is paid for each child of a disabled person, up to the age of 18. This benefit is 61,18 $ in 2004.

7. Survivors' benefits

a) Eligibility

To give entitlement to a surviving spouse's pension, a death benefit or an orphan's pension, a deceased contributor must have paid contributions during one third of his or her contributory period but for not less than 3 years. The minimum number of years of contribution required is never more than 10, no matter how many years the person worked.

A surviving spouse's pension is paid for life to the spouse of the deceased contributor. A spouse is the person to whom the contributory was married, in a civil union or in a de facto union, regardless of sex.

b) Calculation of a pension

i) The initial monthly amount of the surviving spouse's pension, paid to a spouse under 65 years of age, is made up of two portions: a fixed portion and a variable portion equal to 37,5% of the retirement pension accumulated by the deceased contributory.

The fixed portion depends on the surviving spouse's age:

- for a surviving spouse under age 45, the amount is 97,87 $ in 2004, or, if there is a dependent child, 354,81 $;
- for a surviving spouse between the ages of 45 and 54, the amount is 382,14 $ in 2004;
- for a surviving spouse between the ages of 55 and 64, the amount is 399,59 $ in 2004. The initial amount will not be indexed until the fixed portion of the pension for beneficiaries between the ages of 45 and 54, which is 382,14 $, has reached that level.

ii) The initial monthly amount of the surviving spouse's pension paid to a spouse who is 65 years of age or over is equal to 60% of the retirement pension accumulated by the deceased contributor.

iii) If a surviving spouse receives a retirement pension or a disability pension, the initial monthly amount of the surviving spouse's pension may be reduced.

iv) The monthly amount of a surviving spouse's pension is recalculated when the beneficiary reaches 45, 55 or 65 years of age or when he or she becomes entitled to a retirement pension or disability pension.

c) Death benefit

The death benefit is a fixed amount of 2 500 $ for all eligible contributors.

d) Orphan's pension

The orphan's pension is a fixed monthly benefit, which is 61,18 $ in 2004 and which can be paid for each child of the deceased contributor until age 18.

8. Pension indexation

All pensions in payment are increased on 1 January of each year. The increase, as a percentage, is equal to the percentage increase in the Pension Index for that year, compared with the Pension Index for the preceding year.

9. Partition of benefits between former spouses

The pensionable earnings of two former spouses are divided equally for each of the months in which they lived together during their marriage. Partition is automatic for a person who obtains a judgment of divorce, legal separation or civil annulment of marriage, unless the judgment explicitly mentions that there is renunciation.

The partition right is also granted to de facto spouses but both former spouses must make a joint application. The earnings recorded under the Plan for the two spouses are divided equally for the period of cohabitation.

10. Pension sharing

It is possible for spouses who have reached 60 years of age to transfer between themselves a portion of their retirement pensions, based on the number of years of conjugal relationship, for the purpose of income leveling. Sharing is possible even if only one of the spouses has participated in the Plan.

Sharing is carried out on application and ends with the death of either of the spouses or the breakdown of their conjugal relationship. In the case of married spouses, the application can be made by either spouse. In the case of de facto spouses, a joint application must be made by both spouses.

Appendix III

Assumptions and method

1. Introduction

This appendix describes the assumptions made and the method used to carry out the actuarial analysis. Briefly put, the analysis of the Plan is based on 2 parameters: Québec's population and the economic situation. The latter includes employment, inflation, average employment earnings and rates of return on investments. Those parameters, together with the Plan's experience, serve to determine future cash inflows and outflows. The Plan's reserve changes as a function of the difference between, on the one hand, contributions and investment income for a given year and, on the other hand, benefits and administration costs for the same year.

Because of important changes in the demographic structure during the projection period, special attention was given to the description of population changes and the economic assumptions particularly sensitive to those changes.

The report's projections cover a very long period, from 2004 to 2055. For such a period, one should not accord too great a significance to the absolute value of a particular result. It is more important to take into account the generally observed trend, particularly in using the relationships between the various results, for example, the level of the reserve in relation to cash outflows.

The demographic and economic assumptions are described in sections 2 and 3. The succeeding sections focus mainly on the method for projecting contributions (section 4), benefits (section 5) and the reserve (section 6). For rapid reference, see Table 13 on the following page, which summarizes the main assumptions made for this report

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Table 13
Summary of the main assumptions

DEMOGRAPHIC				
Total fertility rate	2004	1,47		
	2015 and after	1,60		
Net migration	2004	Interprovincial:	- 10 000	
		International:	28 500	
		Total:	18 500	
	2010 and after	Interprovincial:	- 7 500	
		International:	30 500	
		Total:	23 000	
			AT BIRTH	**AT AGE 65**
Mortality reduction (Life expectancy)	2004	Men:	77,1	16,9
		Women:	82,1	20,5
	2030	Men :	79,7	18,6
		Women:	84,0	21,8
	2055	Men :	81,7	20,1
		Women :	85,7	23,2
ECONOMIC				
		AGE 15 AND OVER	**AGE 20 TO 64**	
Activity rate	2004	67%	80%	
	2030	59%	83%	
	2055	58%	84%	
Employment (average annual change)	2004-2015	0,5%		
	2015-2025	- 0,3%		
	2025-2035	- 0,3%		
	2035-2055	- 0,2%		
Unemployment rate	2004	9,4%		
	2010	7,5%		
	2018 and after	6,0%		
Inflation rate	2004	1,5%		
	2007-2009	2,0%		
	2014 and after	2,5%		
Real rate of increase in average employment earnings (average annual change)	2004-2009	0,8%		
	2010 and after	1,2%		
Real rate of return on investments	2004	4,4%		
	2009-2015	4,9%		
	2025 and after	4,6%		

2. Demographic assumptions and population projection

Projection of Québec's population serves as the basis for determining the number of Plan contributors and the number of new beneficiaries for each type of benefit. It also allows us to estimate the payment period for benefits.

The population projection was made using an initial estimated population as at 1 July 2003 and assumptions related to mortality, fertility rates, in-migration and out-migration. Thus, the number of individuals of a given age in a given year depends on the number of individuals 1 year younger in the preceding year plus the number of in-migrants less the number of out-migrants and deaths.

A projection was made for each year of age from 0 to 109. The number of individuals aged 0 is represented by the number of births in the year. The population is determined as at 1 July of each year on the basis of the age on the last birthday and on the basis of the age on the nearest birthday. The first serves as the basis for population projection and the second is used primarily for determining benefits that are payable.

In developing the demographic assumptions, several elements were taken into consideration, including the available data and historical trends, the opinions and projections of experts, comparisons with the assumptions made by other public agencies in Québec, in Canada and abroad and public policies for immigration.

2.1 Initial population on 1 July 2003

The initial population was based on an estimate of the population on 1 July 2003 published by Statistics Canada. That estimate is based on the population established in the 2001 census, which was adjusted to take into account census under-numeration and on known data about population movements.

2.2 Mortality

The mortality tables used for the analysis were based on data provided by the Institut de la statistique du Québec covering the Québec population for the years 2000 to 2002. The mortality rates, that is, the probability of death during a given year, vary according to age, sex and year. In 2001, life expectancy at birth was 76,2 years for men and 81,9 years for women.

Mortality tables were established for each year in the projection period, taking into account decreasing mortality rates. If that reduction had not been taken into account for analyzing the Plan, there could have been an underestimation of benefits. However, prudence is necessary over the long term because of uncertainties over reductions in the main causes of death.

In addition to varying according to age and sex, the reduction is higher during some years than others, depending on the projection year. The anticipated mortality reduction for 2002 and 2003 is based on annual mortality reduction factors in Québec from 1991 to 2001. The rate of reduction decreases rapidly up to 2010, and changes are linear between 2004 and 2010.

The final mortality reduction factors used as the basis for projections were established according to the average factors projected from 2010 to 2070, based on the average scenario presented by the United States Social Security Administration in its 2003 Trustees Report. The mortality reduction rates contained in that report, which are given for each age, sex and year, are based on a mortality study by cause of death in 2002.[11]

The initial and final factors were adjusted to take into account the fact that Québec's mortality is lower than that in the U.S. and the fact that a certain limit regarding the possible level of reduction based on age had been reached. Table 14 gives a sample of mortality rates by age and sex for the years 2004, 2030 and 2055.

The annual increase in life expectancy at the beginning of the projection period reflects the increase observed over the last 10 years. Thereafter, the rate of increase slows, it being assumed that certain causes of death cannot be reduced beyond a certain point and that decreases in the frequency of some diseases will have the effect of increasing the frequency of other diseases.

Furthermore, the impact of new technologies, genetic research and new medications on life expectancy is difficult to determine. Lifestyle and environment today appear to be the most influential factors on the mortality of individuals.

From 2004 to 2055, life expectancy at birth will increase from 77,1 years to 81,7 years for men and 82,1 years to 85,7 years for women. Table 15 gives life expectancy at various ages for men and for women, according to the mortality table for each year. We see that life expectancy at age 60 will increase by 3,5 years for men and 2,9 years for women during the projection period.

The values given in Table 15 are indicators of the global level of mortality for the population in a given year and can thus be compared with mortality data published by other agencies. However, they are not actually representative of an individual's future life expectancy at a given time since they do not take into account the projected reductions in mortality for succeeding years.

In fact, if subsequent reductions in mortality are taken into account, that is, reductions that will occur during an individual's life and which will be to his or her advantage, life expectancy at age 60 is 1,2 years greater for men in 2004, reaching 22,0 years, and 1,1 years for women of the same generation, reaching 25,8 years. These data are shown in Table 16 and give a more precise idea of an individual's retirement period.

11. Felicitie C. BELL and Michael L. MILLER, *Life Tables for the United States Social Security Area 1900-2100*, Actuarial Study No. 116, Social Security Administration, Office of the Actuary, 2002.

Table 14
Mortality rates for the population of Québec
(per thousand)

	MEN			WOMEN		
AGE	2004	2030	2055	2004	2030	2055
0	4,7	3,6	2,9	3,9	3,1	2,6
10	0,1	0,1	0,1	0,1	0,1	0,1
20	0,9	0,7	0,6	0,4	0,3	0,2
30	0,8	0,6	0,5	0,3	0,3	0,2
40	1,4	1,1	0,9	0,9	0,8	0,6
50	3,5	2,7	2,1	2,4	1,9	1,6
60	9,6	7,3	5,8	5,6	4,5	3,8
65	15,7	12,2	10,0	8,9	7,2	6,0
70	25,7	20,2	16,7	14,3	11,6	9,7
75	42,0	33,3	27,5	24,0	19,5	16,3
80	70,5	55,9	45,6	42,7	35,1	29,1

Table 15
Life expectancy for the population of Québec, excluding subsequent reductions in mortality

	MEN			WOMEN		
AGE	2004	2030	2055	2004	2030	2055
0	77,1	79,7	81,7	82,1	84,0	85,7
10	67,5	70,0	72,0	72,6	74,3	76,0
20	57,8	60,2	62,2	62,7	64,4	66,1
30	48,2	50,6	52,5	52,9	54,6	56,2
40	38,7	41,0	42,8	43,2	44,8	46,4
50	29,4	31,5	33,3	33,7	35,3	36,8
60	20,8	22,7	24,3	24,7	26,2	27,6
65	16,9	18,6	20,1	20,5	21,8	23,2
70	13,4	14,9	16,2	16,5	17,7	19,0
75	10,2	11,5	12,7	12,8	13,8	15,0
80	7,6	8,6	9,6	9,5	10,3	11,3

Table 16
Life expectancy for the population of Québec, including subsequent reductions in mortality

	MEN			WOMEN		
AGE	2004	2030	2055	2004	2030	2055
60	22,0	23,8	25,5	25,8	27,3	28,8
65	17,8	19,4	21,0	21,3	22,7	24,1
70	14,0	15,5	16,9	17,0	18,4	19,7
75	10,6	11,9	13,1	13,1	14,3	15,5
80	7,8	8,9	9,9	9,6	10,6	11,6
90	4,0	4,7	5,3	4,6	5,2	5,9

2.3 Births

The basic assumption made to determine births is the total fertility rate. For a given year, that rate is obtained by adding the fertility rates by age for all ages. The rate therefore represents the number of children that a given generation of women will have during their period of fertility (ages 15 to 49), if the observed fertility rates by age for a given year were applied to them.

After a pronounced drop in the 1960s, the total fertility rate reached a level of 2,1 children per woman in 1970, which is the threshold for population replacement in the absence of migration. The reduction continued at a much slower rate, reaching its low point at 1,36 children per woman in 1987. Thereafter, the rate increased, reaching 1,66 in 1992 and then dropped again, reaching 1,45 in 2000. It has increased slightly in recent years.

For this report, it was assumed that the rate of 1,47 used in 2004 will increase gradually and reach 1,60 in 2015. That rate is less than the rate projected in the preceding actuarial report, which was 1,65. After 2015, the rate will remain constant (see Chart 9). The average rate projected for the next thirty years (2003-2032) is 1,57, which is similar to the rate observed over the last thirty years (1973-2002).

The fertility rate measured at age 45, also called the completed fertility rate, reflects the total fertility rate for a generation of women over time. The measurement (observed and projected) for all women born prior to 1973 is higher than the chosen final fertility rate. However, for generations born between 1974 and 1993, the completed fertility rate projected is slightly lower at 1,6 children. In fact, despite an increase in the total fertility rate, the generational fertility rate observed at age 45 will decline until 2024, when it will be 1,53. It increases thereafter to reach the fertility rate in 2042.

The increase in fertility was applied non-uniformly to women between the ages of 15 and 45. For example, the average fertility rate for women between the ages of 25 and 29 will increase by 14%, from 2004 to 2015, compared to 6% for women ages 35 to 39. Due to these fluctuations, the average age of mothers estimated on the basis of fertility rates decreases by 2 months between 2004 and 2015, to the age of 28 years and 2 months.

Table 17 gives the average annual fertility rate per 1 000 women by age group.

The masculinity rate for births was set throughout the projection period at the average level observed between 1998 and 2002, that is, 51,3%. That means that there are about 51 boys and 49 girls per 100 births, which partially offsets the increased mortality of men in various periods of their lives.

It should be noted that birth assumptions do not have a great effect on short and medium term results since it is the population aged 18 and over that has an impact on the Plan's cash inflows and outflows. Therefore, the births from one year will have an effect on the number of new contributors approximately twenty years later.

Chart 9
Total fertility rate and generational fertility at age 45

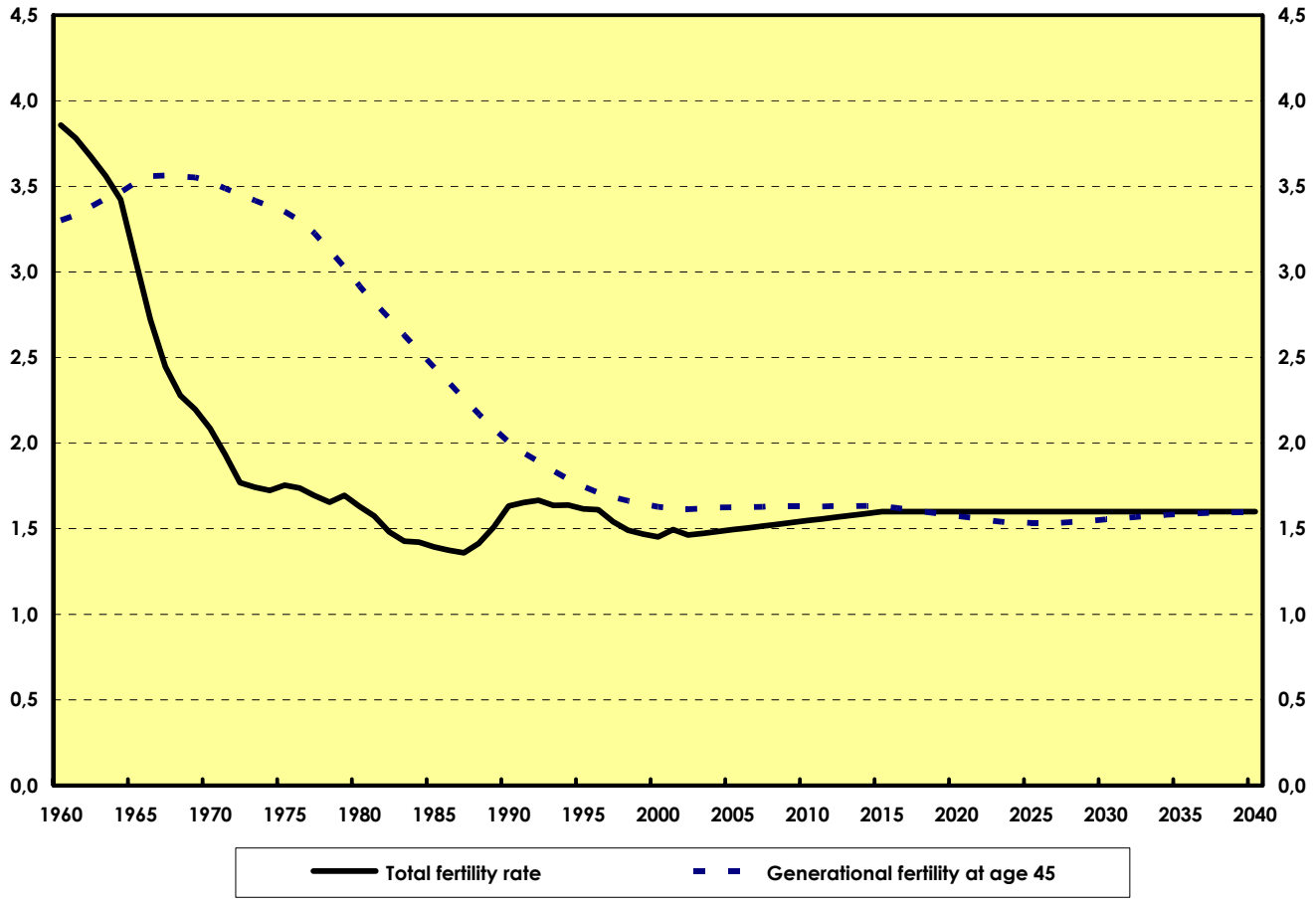


Table 17
Fertility rates and total fertility rate

YEAR	AVERAGE ANNUAL FERTILITY RATE BY AGE GROUP (FOR 1 000 WOMEN)							TOTAL FERTILITY RATE (PER WOMAN)
	15 TO 19	20 TO 24	25 TO 29	30 TO 34	35 TO 39	40 TO 44	45 TO 49	
2004	12,5	56,1	105,7	85,5	29,8	4,5	0,2	1,47
2005	12,6	56,7	107,0	85,7	30,0	4,5	0,2	1,48
2006	12,8	57,2	108,3	85,9	30,1	4,5	0,2	1,50
2007	12,9	57,7	109,6	86,2	30,3	4,5	0,2	1,51
2008	13,0	58,2	110,9	86,4	30,4	4,5	0,2	1,52
2009	13,2	58,8	112,2	86,6	30,6	4,5	0,1	1,53
2010	13,3	59,3	113,5	86,8	30,7	4,5	0,1	1,54
2015+	14,0	61,9	120,0	88,0	31,5	4,5	0,1	1,60

2.4 Migration

Net migration is the difference between in-migration and out-migration during a year, both internationally and interprovincially. In the last decade, Québec's net migration has oscillated between a slightly negative level and a positive level of about 35 000 people, with the average being about 12 500 people, that is, 0,17% of the population.

It is difficult to predict net migration because of the set of factors that can affect each of its components.

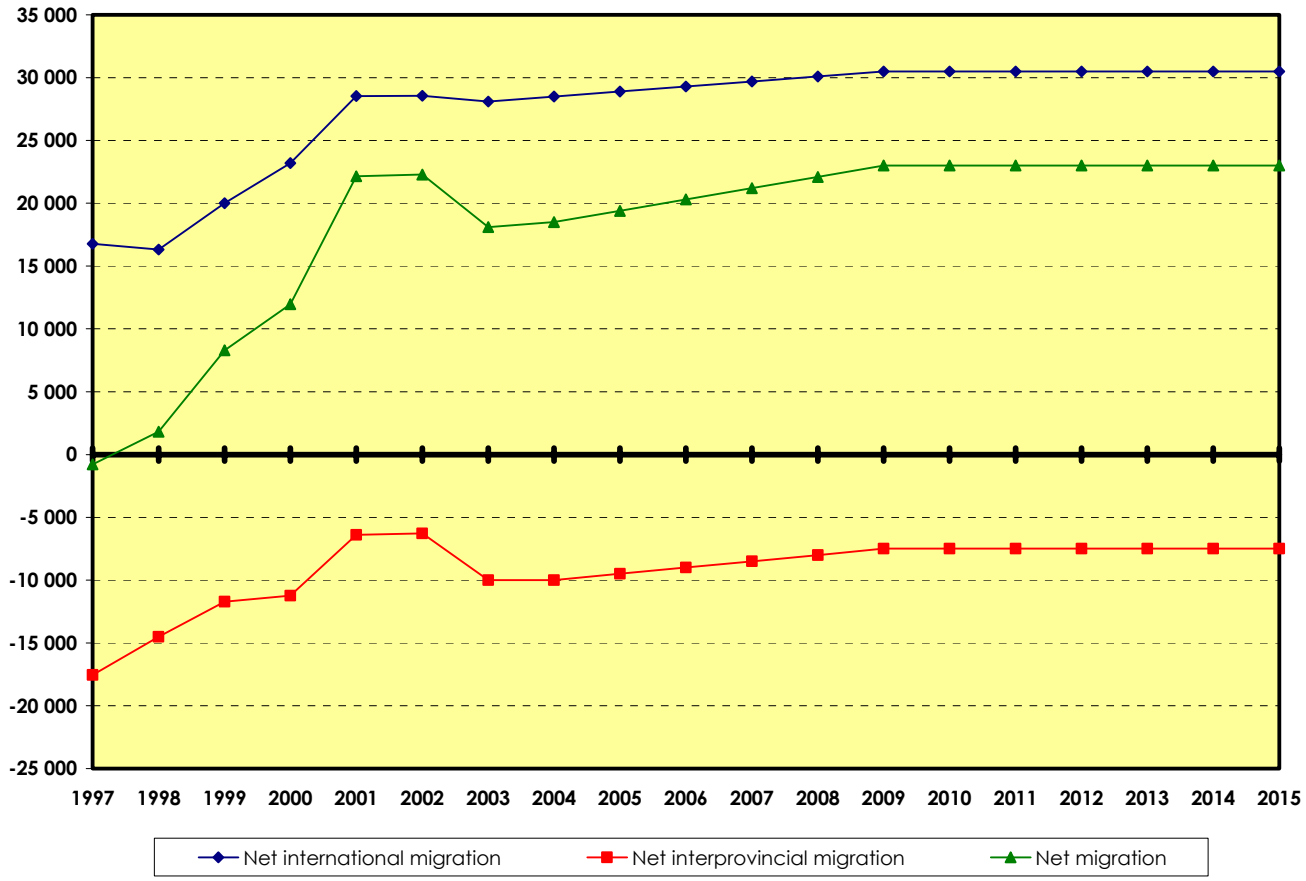
The assumption made for net migration is 18 500 (0,25% of the population) in 2004 and increases progressively to reach 23 000 in 2010, that is, 0,30% of the population, as shown in Chart 10.

It is assumed that as of 2009, the number of international immigrants remains stable at 40 000. Net international migration will be 30 500, that is, about 0,40% of the population. This assumption was established on the basis of international immigration targets adopted by the Minister of Relations with the Citizen and Immigration that were disclosed in February 2004.

With regard to the net interprovincial migration, a reversal of historical trends has been noted in recent years. This number has changed from -17 000 in 1997 to approximately -6 000 in 2001 and 2002. In the future, the favourable labour market outlook should have a positive effect on the retention of Quebeckers, with the result that net interprovincial migration will improve from an initial level of -10 000 (-0,13% of the population) in 2004 to -7 500 (-0,10%) in 2010.

The breakdown of in-migrants and out-migrants by age group and sex used for this report is based on estimates by Statistics Canada for the period from 1 July 1999 to 1 July 2002. According to that breakdown, the average age of in-migrants is 28 years and that of out-migrants is 31 years.

Chart 10
Net migration for Québec (1997-2015)



2.5 The projected population and its characteristics

The estimated population of Québec on 1 July 2003 is 7 487 000 people. Chart 11 shows changes in the total population and in the population of people aged 20 to 64 years since the Plan began and until the end of the projection period.

Table 18 shows the projected population on 1 July of each year, with some of its characteristics. For the next 10 years, population growth will be relatively stable, with an average annual increase of 0,45%. Thereafter, growth will slow. In 2031, the population will reach a peak of 8 170 000, and will then decline, reaching 7 859 000 in 2055. The number of people between the ages of 20 and 64 years, which is estimated to be 4 778 000 in 2004, will increase, reaching a peak of 4 920 000 in 2014 and then returning in 2023, to its initial level. As of 2020, that group declines on average by nearly 32 000 people per year, reaching 4 512 000 in 2030.

Chart 11
Population of Québec
(in millions)

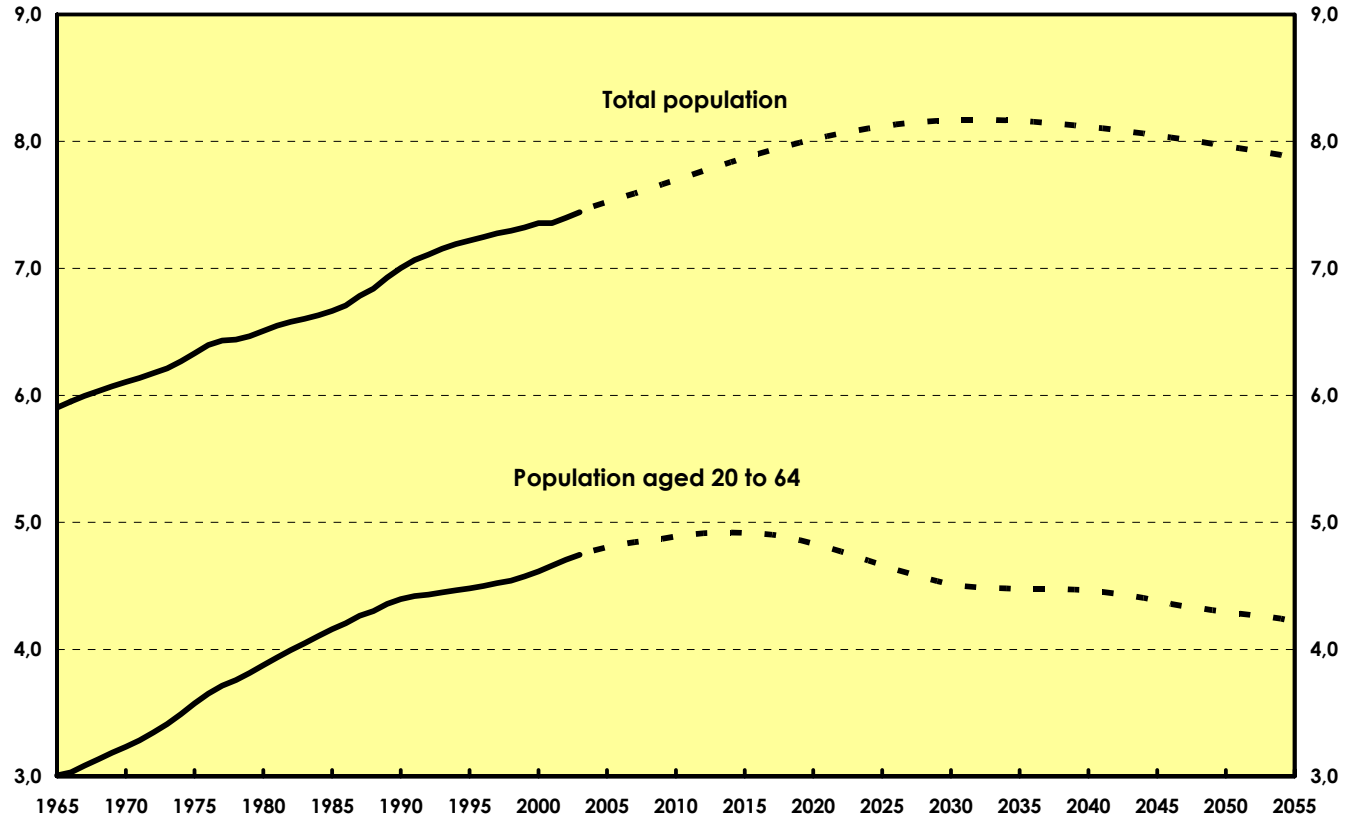


Table 18
Projection of the population of Québec

A) NUMBER OF PEOPLE BY AGE GROUP (in thousands)

YEAR	0 TO 17	18 AND 19	20 TO 64	65 AND OVER	TOTAL
2004	1538	185	4 778	1 021	7 521
2005	1528	181	4 805	1 041	7 555
2006	1519	178	4 827	1 066	7 590
2007	1507	181	4 844	1 092	7 625
2008	1489	192	4 857	1 122	7 660
2009	1470	201	4 871	1 154	7 696
2010	1452	203	4 889	1 188	7 732
2015	1412	179	4 919	1 391	7 901
2020	1438	158	4 832	1 612	8 040
2025	1452	162	4 662	1 857	8 133
2030	1427	169	4 512	2 062	8 169
2035	1381	172	4 477	2 124	8 154
2040	1343	167	4 463	2 130	8 103
2045	1326	159	4 382	2 164	8 031
2050	1325	153	4 294	2 174	7 946
2055	1321	153	4 220	2 166	7 859

B) PERCENTAGE BREAKDOWN BY AGE

YEAR	0 TO 17 AS A PERCENTAGE OF THE TOTAL	18 AND 19 AS A PERCENTAGE OF THE TOTAL	20 TO 64 AS A PERCENTAGE OF THE TOTAL	65 AND OVER AS A PERCENTAGE OF THE TOTAL	65 AND OVER AS A PERCENTAGE OF THE 20 TO 64 AGE GROUP
2004	20,5	2,5	63,5	13,6	21,4
2005	20,2	2,4	63,6	13,8	21,7
2006	20,0	2,3	63,6	14,0	22,1
2007	19,8	2,4	63,5	14,3	22,5
2008	19,4	2,5	63,4	14,6	23,1
2009	19,1	2,6	63,3	15,0	23,7
2010	18,8	2,6	63,2	15,4	24,3
2015	17,9	2,3	62,3	17,6	28,3
2020	17,9	2,0	60,1	20,1	33,4
2025	17,8	2,0	57,3	22,8	39,8
2030	17,5	2,1	55,2	25,2	45,7
2035	16,9	2,1	54,9	26,0	47,4
2040	16,6	2,1	55,1	26,3	47,7
2045	16,5	2,0	54,6	27,0	49,4
2050	16,7	1,9	54,0	27,4	50,6
2055	16,8	1,9	53,7	27,6	51,3

Table 18 also shows the relative size of some age groups. Within approximately 30 years, the number of people aged 65 and over will double as a percentage of the total population and, as a proportion of people aged 20 to 64 years, it represents more than 50% at the end of the projection period. In other words, in 2055, there will be slightly fewer than two workers for each retiree. Changes in the latter proportion impacts strongly on changes in the ratio of benefits to contributions. Chart 12, which shows the breakdown of the Québec population for some age groups, clearly illustrates that population aging will increase between 2015 and 2030.

Table 19 gives the annual population variation, that is, the total births and net migration less deaths. Chart 13 illustrates changes in births, migration and deaths in Québec for the period from 2004 to 2055. As of 2031, the number of deaths will be greater than the sum of births and net migration, which will result in a drop in the Québec population.

Chart 12
Breakdown of the Québec population

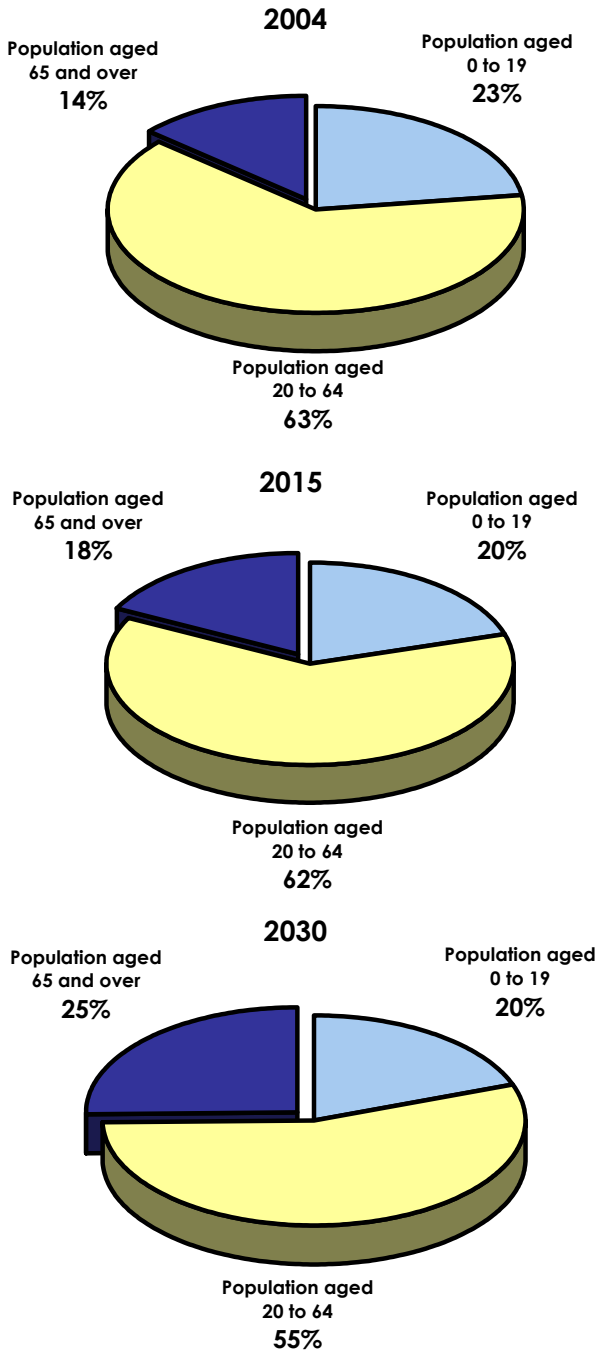
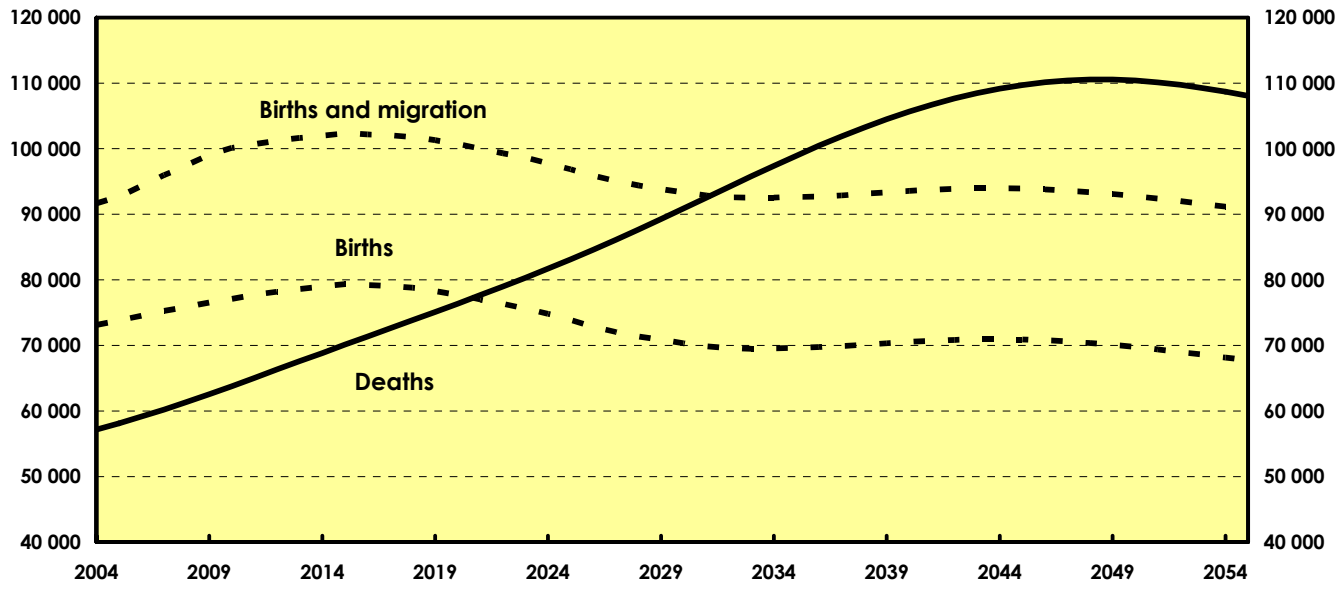


Table 19
Components of Québec's demographic variation
(in thousands)

YEAR	POPULATION ON 1 JANUARY	BIRTHS	NET MIGRATION	DEATHS	ANNUAL POPULATION VARIATION
2004	7 504,1	73,1	18,5	57,6	34,0
2005	7 538,1	73,8	18,9	58,6	34,0
2006	7 572,1	74,5	19,8	59,7	34,6
2007	7 606,8	75,3	20,7	60,8	35,2
2008	7 642,0	75,9	21,6	62,0	35,5
2009	7 677,5	76,6	22,5	63,2	35,9
2010	7 713,4	77,1	23,0	64,4	35,7
2015	7 884,2	79,4	23,0	70,7	31,6
2020	8 027,8	77,7	23,0	77,0	23,7
2025	8 125,8	73,8	23,0	83,8	13,0
2030	8 167,2	70,3	23,0	91,7	1,6
2035	8 156,3	69,6	23,0	99,7	-7,1
2040	8 108,5	70,6	23,0	106,2	-12,7
2045	8 037,6	70,9	23,0	109,9	-16,0
2050	7 953,7	69,8	23,0	110,3	-17,5
2055	7 866,6	67,7	23,0	107,7	-17,0

Chart 13
Births, migration and deaths in Québec



3. Economic assumptions

The economic assumptions concern changes in activity and employment rates, the unemployment rate, the inflation rate, average employment earnings and the rate of return on investments.

Since the purpose of the actuarial analysis is the projection of the Plan's cash inflows and outflows until 2055, the assumptions are based on structural factors rather than on factors that are responsible for cyclical fluctuations. These assumptions are therefore developed on the basis of moderate and sustained economic growth.

To make the best estimate of changes in the economic variables relevant to the analysis, several elements were taken into account, including historical data and trends, various public policies, such as manpower policy and monetary policy, studies carried out by experts, forecasts made by public and private agencies as well as the results of comparisons made on the interprovincial, national and international levels.

3.1 Labour market

The following diagram shows the makeup of the population in terms of the various components of the work force. The projections from now until 2055 of labour market indicators, mainly the projection of employed persons were used to determine the number of Plan contributors.

The historical data on labour market indicators were taken from the Labour Force Survey carried out by Statistics Canada. The population projection, described in section 2, determines changes in the population aged 15 and over.

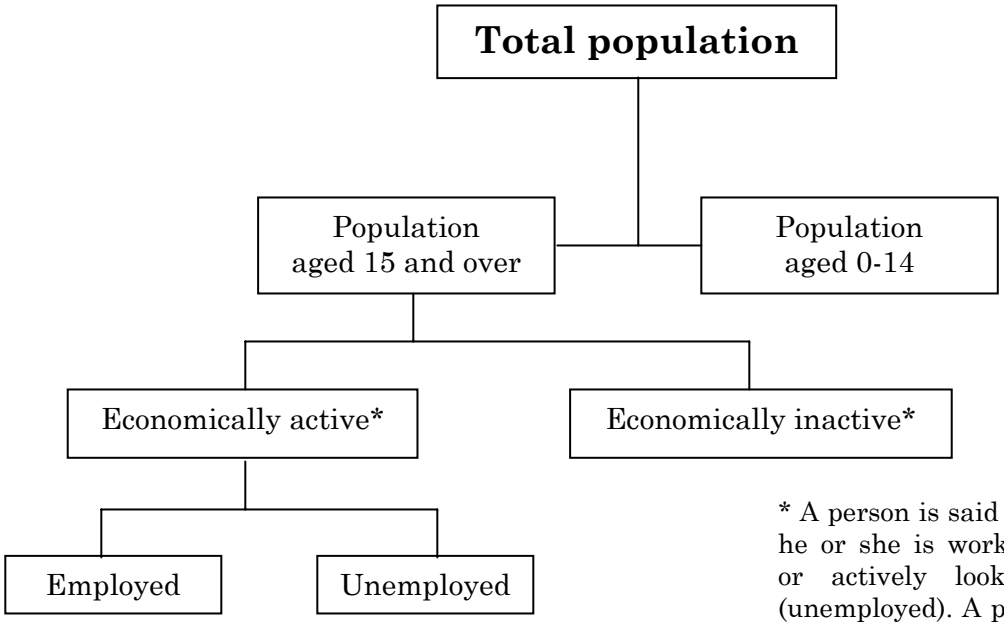
An adjustment was made, based on the concepts underlying the Survey. After adjustment, the population aged 15 and over corresponds to the civilian population outside institutions and Indian reserves aged 15 and over.

3.1.1 Activity rate and projection on the economically active population

An activity rate assumption was made for each 5-year age group, by sex. Applying those activity rates to the population aged 15 and over make it possible to project the economically active population (labour force).

Although the ratio between the economically active population and the population aged 15 and over, that is, the overall activity rate, is the result of the interaction of a number of actors, changes in the overall activity rate is affected primarily by the population's distribution by age and sex.

The probability of entering the labour market or remaining in it varies considerably during a person's lifetime. It is relatively low among young people, primarily because of school attendance. It is at its highest among adults and then begins to drop at age 50, becoming marginal among the elderly. Currently, baby boomers are between the ages of 40 and 60 and represent half of the active population. The aging of this group of workers will lead to a major decline in the overall activity rate over the next 20 years.



* A person is said to be "active" if he or she is working (employed) or actively looking for work (unemployed). A person is said to be "inactive" in all other cases.

Effect of population aging on the overall activity rate

To get an idea of the effect that population changes by age and sex can have on the overall activity rate over the next fifty years, the activity rates for the year 2003 were applied, by five-year age group and by sex, to the projection of the working-age population. For that simulation, it was assumed that the current behaviour of the population with respect to labour force participation would continue throughout the projection period. Results show a continual decline in the activity rate of the population aged 15 and over, from 66,0% in 2003 to 55,7% in 2030, reaching 53,6% in 2055.

Such a simulation, based solely on demographic change, shows that population aging will put considerable downward pressure on the overall activity rate from now until 2030. The effect of aging will be less afterward.

Socio-economic factors will also have an effect on labour force participation. If the activity rates by age group and by sex remained at their 1976 levels, the activity rate for the population aged 15 and over would have been only 55% in 2003, whereas in fact, it was 66,0%. The increase in the activity rate for the population aged 15 and over, from 58,8% in 1976 to 66,0% in 2003, can be primarily attributed to the marked increase in the participation of women in the labour force.

As in the past, it is expected that throughout the projection period, socio-economic factors will in part offset the negative demographic effects on the overall activity rate.

The 15 to 24 age group

The two main factors that affect the economic activity of young people are labour market conditions and school attendance. On the one hand, an improvement in labour market conditions caused by the expected scarcity of manpower could be favourable to increased economic activity among young people. On the other hand, the current high rate of school attendance should continue, leaving in all likelihood little room for an increase in activity rates.

In the past, the qualifications required for labour market entry increased. Because of the expected changes in the Québec economy, the requirements set by employers and the demand for more highly educated workers is likely to continue.

With regard to outlook for employment, young people have understood that the chances for success are better if they are more highly educated. The school attendance rate for young men and young women in the 15 to 19 and 20 to 24 age groups began going up at the beginning of the 1980s. However, those rates levelled off several years ago. In fact, school attendance in Québec has remained stable since 1991 among those in the 15 to 19 age group, and since 1996 in the 20 to 24 age group. The importance given to education seems to be a structural phenomenon and may have peaked.

For the age groups 15 to 19 and 20 to 24, activity rates are expected to decline slowly over the coming years and stabilize in 2015. For the 15 to 19 age group, activity rates should be equivalent to the average rates observed from 1991 to 2001, at 46,3% for men and 42,4% for women. For the 20 to 24 age group, activity rates should correspond to the average rates for the years 1996 to 2001, that is, 78,5% for men and 71,8% for women.

The 25 to 54 age group

Men aged 25 to 54 have the highest level of participation in the labour force. Between 1976 and 1995, the activity rates for all age groups have shown slight declines. The downward trend, however, has reversed since 1995.

The activity rates for men are expected to increase gradually until 2015 for the 5-year age groups between 25 and 49 and until 2020 for the 50 to 54 age group. Since activity rates for adult men are already relatively high, increases will be limited to a recovery of activity declines over the last two decades. Two factors favour an increase in activity rates for men: the arrival of more highly educated cohorts and an improvement in employment opportunities because of the expected scarcity of manpower.

The activity rates for women in all the 5-year age groups between 25 and 54 increased considerably between 1976 and 2003. However, the increased participation of women in the labour force, which began several decades ago, has slowed recently. During the last decade, adult women have maintained, as have men, a high level of activity. The gap between the activity rates for men and women has narrowed, but the rate of narrowing was slower in the 1990s.

Women continue to seek higher levels of education, which should result in an increase in their level of labour force participation. Women now represent the majority of full-time university students. In 2003, the number of active women aged 15 and over who had a university diploma was higher than that of men. The gap between the activity rates for men and women narrows as education increases.

Nevertheless, the predominant role of women as child-care givers will probably prevent the complete elimination of the gap between the

activity rates for adult men and women, although the vast majority of women (approximately 3 out of 4) are now returning to the labour force within one year of the birth of a child.

Activity rates are expected to increase progressively until 2015 for women aged 25 to 39 and until 2020 for those aged 40 to 54. The activity rates for women aged 40 to 54 will probably level off later since their higher levels of education have had less effect until now. Moreover, current generations of younger women will probably continue to have a higher level of activity when they reach that age group.

The 55 to 64 age group

Between 1984 and 1996, activity rates for men aged 55 to 64 declined continuously, dropping 8,6 and 13,1 percentage points respectively for age groups 55 to 59 and 60 to 64.

The situation for older workers who lost their jobs was difficult. The trend among these age groups was retirement, either voluntarily or otherwise, at an increasingly earlier age. In the case of voluntary separation, employers used early departures as a means of renewing manpower. This method became extremely popular with workers. In the case of involuntary separation, many employers laid off workers to reduce their payroll and lower the average age of employees. However, since 1996, this trend towards earlier retirement has reversed.

Manpower scarcity, higher education of older workers, increased popularity for phased retirement programs, and government initiatives now focused on employment security rather than income support seems to favour a recovery in the activity rates for men aged 55 to 59 and 60 to 64. For both sexes, the activity rates of these two age groups increases gradually over the entire projection period. However, the increases anticipated for women are higher than for men.

The 65 and over age group

The assumption made for men aged 65 and over is a downward trend until 2030. This trend has prevailed since 1976 (except for the years 2001 to 2003, when men aged 65 and over also took advantage of the windfall of employment brought on by a favourable economy). The trend is attributed to an increasingly larger proportion of much older men within this group. The participation of women aged 65 and over in the labour market has been rather marginal over the last 25 years. This trend, however, is expected to increase in the coming decades.

It appeared important to analyze separately the behaviour of workers aged 65 to 69 and those aged 70 and over. In fact, historical data show significantly different activity rates for both sexes in those two age groups.

For people aged 65 to 69, the changes in activity rates are different for both sexes. For men, the rate is expected to fall until 2030 and reach a level slightly lower than the historical average from 1976 to 2002. This decline takes into account the fact that the number of jobs available for people aged 65 to 69 is expected to remain relatively steady as this age group continues to grow. However, the activity rate should increase after 2030, until the end of the projection period in 2055, to take into account the anticipated increase in life expectancy over the coming decades.

Higher levels of education for working women aged 65 to 69 will have less of an impact than for women aged 55 to 64. Nonetheless, this factor, combined with a higher life expectancy, should contribute to increasing the activity rate of this age group throughout the entire projection period.

Strong growth of the population aged 70 and over is also expected over the coming decades. In fact, the total population of this age group is expected to double between 2003 and 2035. Activity rates are thus expected to constantly decrease slightly until this population becomes stable in 2035. Thereafter, activity rates increase very slightly to take into account, again, the expected increase in life expectancy.

Table 20 shows the activity rate assumptions made for men and women, by 5-year age group in 2004, 2015, 2030 and 2055.

Table 20
Activity rate by age group and by sex

	MEN				WOMEN			
AGE GROUP	2004	2015	2030	2055	2004	2015	2030	2055
15 to 19	52,8	46,3	46,3	46,3	51,2	42,4	42,4	42,4
20 to 24	83,0	78,5	78,5	78,5	78,4	71,8	71,8	71,8
25 to 29	91,9	92,4	92,4	92,4	82,2	88,6	88,6	88,6
30 to 34	93,0	94,5	94,5	94,5	84,0	87,5	87,5	87,5
35 to 39	94,0	94,7	94,7	94,7	85,0	87,5	87,5	87,5
40 to 44	93,4	93,7	93,7	93,7	86,0	87,9	88,0	88,0
45 to 49	92,0	92,4	92,4	92,4	83,5	86,7	87,0	87,0
50 to 54	87,4	88,0	88,5	88,5	76,2	81,5	84,0	84,0
55 to 59	73,5	76,3	79,7	84,7	52,0	66,5	76,0	80,5
60 to 64	46,7	50,5	55,0	60,0	26,0	34,9	49,0	56,5
65 to 69	16,0	14,8	13,4	15,9	6,6	7,2	8,9	12,9
70 and over	4,6	3,5	2,0	2,5	0,9	0,7	0,5	1,6
20 to 64	85,7	84,7	85,8	86,4	74,4	76,5	80,1	81,1
15 and over	72,8	68,4	62,2	60,7	60,3	58,7	54,7	54,3

The increases expected in activity rates between now and 2030 in most 5-year age groups of men and women will partially offset the negative demographic impact on overall activity.

Between 2003 and 2030, the activity rate of the population aged 20 to 64 will increase 3,8 percentage points, rising from 79,2% to 83,0%. Between 1976 and 2003, that rate increased by 11,4 percentage points. The more moderate increase foreseen for this aggregate activity rate (ages 20 to 64) can be attributed, in large part, to the presence of the numerous baby-boom generations in age groups where economic activity drops off, that is, beginning after age 50.

The effect of aging is, of course, even more obvious when the aggregate activity rate is expressed for the population aged 15 and over. The rate falls by 7,5 percentage points, dropping from 66,0% to 58,5% between 2003 and 2030. It increased by 7,2 points between 1976 and 2003.

Table 21 shows changes in labour force and aggregate activity rates. A slower increase in the labour force is anticipated until 2012, followed by a decline. The population of the labour force in 2055 will be smaller than in 2003. The situation of relatively abundant manpower observed in the last few decades will be headed toward a situation of scarcity.

Table 21
Labour force changes and aggregate activity rates

	LABOUR FORCE		ACTIVITY RATE FOR PERSONS AGED 20 TO 64			ACTIVITY RATE FOR PERSONS AGED 15 AND OVER		
YEAR	TOTAL	CHANGE	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
	(in thousands)	%	%	%	%	%	%	%
1976	2 791	-	89,3	46,8	67,9	76,6	41,4	58,8
1980	3 059	2,3	88,9	53,2	70,9	77,0	46,3	61,3
1990	3 504	1,4	85,7	64,6	75,1	74,6	54,3	64,2
2000	3 753	0,7	83,5	69,2	76,4	70,9	56,1	63,3
2005	4 115	1,9	85,5	75,1	80,4	72,5	60,7	66,5
2010	4 193	0,4	85,0	75,8	80,5	70,6	59,9	65,2
2015	4 185	0,0	84,7	76,5	80,7	68,4	58,7	63,5
2020	4 139	-0,2	84,7	77,8	81,3	66,4	57,6	62,0
2025	4 049	-0,4	85,2	78,8	82,0	64,1	55,8	60,0
2030	3 978	-0,4	85,8	80,1	83,0	62,2	54,7	58,5
2035	3 949	-0,1	85,9	80,3	83,2	61,5	54,3	57,9
2040	3 928	-0,1	85,6	80,2	83,0	61,3	54,3	57,8
2045	3 879	-0,3	85,9	80,5	83,3	61,0	54,2	57,6
2050	3 824	-0,3	86,3	80,9	83,7	60,8	54,3	57,5
2055	3 773	-0,3	86,4	81,1	83,8	60,7	54,3	57,5

3.1.2 Working life to retirement ratio

Calculation of the working life to retirement ratio, presented in section 5.4.3 of the actuarial report, requires a calculation of the average number of working years and, consequently, the average age of retirement from the labour market. The ratio is calculated according to the cohort method. This method consists of first enumerating the overall working population of one 5-year age group in a given year, then enumerating the working population of the following 5-year age group five years later. By subtracting the second number from the first, the result is the number of persons of this cohort who have left working life during the five years separating the two enumerations.

This calculation of the average age of retirement from the labour market is established in comparison to the economically active population between the ages of 45 to 49. This is based on two assumptions:

- the uniform distribution of people in a given age group;
- a uniform distribution of the periods of departure from the labour market.

These assumptions result in an assessment that a given cohort leaves the work force, on average, around the age of the beginning of the following age group. For example, a cohort aged 50 to 54 in 2000, which is then aged 55 to 59 in 2005, leaves the work force during this period on average around age 55.

The average age of retirement from the labour market corresponds to the average retirement age, weighted by the number of retirements at each age. The period of working life is calculated using an assumed age of entry into the labour force, determined at age 20. The period of retirement corresponds to the life expectancy calculated at the average age of retirement from the work force.

3.1.3 Employment and the unemployment rate

In the long term, employment changes will mirror labour force changes. Employment will increase at an average rate of 0,9% between 2003 and 2010, remaining stable until 2020. Then, it will decrease by 0,4%, on average, between 2020 and 2030. The decline will be slower thereafter since downward demographic pressure will have less effect on labour force changes.

The level of employment projected for 2055 will be lower than the level in 2003. In the context of manpower scarcity, unemployment will gradually decrease. The unemployment rate, which was 9,1% in 2003, will reach its lowest level, 6% in 2018. Table 22 shows changes in employment and the unemployment rate.

Table 22
Changes in employment and the unemployment rate

	EMPLOYMENT (in thousands)				UNEMPLOYMENT RATE
YEAR	MEN	WOMEN	TOTAL	CHANGE	TOTAL
				%	%
1976	1 647	902	2 549	-	8,7
1980	1 701	1 051	2 752	1,9	10,0
1990	1 783	1 359	3 141	1,3	10,4
2000	1 884	1 554	3 438	0,9	8,4
2005	1 999	1 736	3 734	1,7	9,3
2010	2 071	1 808	3 878	0,8	7,5
2015	2 088	1 829	3 917	0,2	6,4
2020	2 066	1 825	3 891	-0,1	6,0
2025	2 021	1 786	3 807	-0,4	6,0
2030	1 977	1 763	3 739	-0,4	6,0
2035	1 959	1 753	3 712	-0,1	6,0
2040	1 947	1 746	3 693	-0,1	6,0
2045	1 920	1 727	3 647	-0,3	6,0
2050	1 891	1 704	3 595	-0,3	6,0
2055	1 865	1 682	3 547	-0,3	6,0

3.2 Rate of inflation

Inflation, measured by the rate of increase in the Consumer Price Index for Canada, determines the rate of indexation for pensions. It is also an important element in assumptions related to average employment earnings and yields on investments.

During the last twelve years, inflation has stayed at a low, stable level after fluctuating strongly in previous decades. From 2,7% between 1961 and 1970, the average annual inflation rate climbed to 8,1% from 1971 to 1980 and then dropped to 6,0% between 1981 and 1990 and then to 2,1% from 1991 to 2003.

The desire of the federal government and the Bank of Canada to maintain the strategy for inflation control implemented in 1991 leads us to expect a weak inflation rate for the coming years. In May 2001, the Canadian government and the Bank of Canada announced that they would maintain their inflation control objective until the end of 2006. In the next few years, the Canadian monetary policy will be to keep the inflation rate at around 2%, that is, the midpoint of the target bracket of 1 to 3%.

The inflation assumption made for this report was 1,5% in 2004, based on the forecasts of the principal financial institutions. For 2005 and 2006, inflation is expected to increase slowly to 1,8% and 1,9% respectively. Inflation for 2007 to 2009 was assumed to be 2%, that is, the midpoint of the announced target bracket. Thereafter, it will increase gradually and approach historical averages. Price pressures may occur over the projection period. The inflation rate will reach 2,5% in 2014 and remain at that level until the end of the projection period. The indexation rate for pensions will be equal to the inflation rate from the preceding year as of 2005.

3.3 Real rate of increase in average employment earnings

During the last several decades, the abundance of manpower has been a limiting factor in the real increase in employment earnings. Over the last 30 years, this growth was on average only 0,1%.[12]

The assumption made for real growth in wages is based primarily on expectations of changes in labour productivity and a shrinking labour market due to the scarcity of manpower. From 2004 to 2014, the nominal rate of increase in average earnings climbs from 1,9% to 3,7%. When inflation is excluded, the real rate of increase is 0,4% in 2004, 0,6% in 2005 and 0,8% in 2006. It then increases by 0,1% each year until 2010 reaching 1,2% and remaining at this level thereafter.

In the long term, the real rate of increase in employment earnings will be tied to increases in labour productivity, which depends on a number of factors:

- Demographic changes: generally, one considers that the productivity of a worker increases up to the midpoint of his or her career. It then stabilizes for some or falls for others. However, the portion of the population represented by people age 65 and over will more than double by 2030. This factor taken separately, would limit the anticipated increase in worker productivity.

- Worker training: given that currently the level of training of young workers is higher than that of older workers, the older workers of tomorrow will be better educated (and therefore more productive) than those today. Moreover, since better educated individuals tend to work longer, they will remain in the labour market longer. This phenomenon will contribute to increasing labour productivity.

- Hours worked: the number of hours worked will have an effect on productivity per worker. The scarcity of manpower should make full-time employment more available to people who work part-time due to difficult economic conditions.

- Capital investment: in the coming years, a shrinking labour force should bring businesses to substitute capital for labour where possible. Therefore, although investment growth is expected to slow as the technological sector reaches its full development, it will remain strong over the next twenty years and labour productivity will increase.

Table 23 indicates the assumptions made for inflation and the increase in average employment earnings. For projection purposes, maximum pensionable earnings (MPE) for the Plan will mirror changes in the average annual earnings in Québec.

12. Sources: Canadian Institute of Actuaries and the Régie des rentes du Québec.

Table 23
Rates of inflation and increase in average employment earnings

YEAR	INFLATION	INCREASE IN AVERAGE EMPLOYMENT EARNINGS
	%	%
2004	1,5	1,9
2005	1,8	2,4
2006	1,9	2,7
2007	2,0	2,9
2008	2,0	3,0
2009	2,0	3,1
2010	2,1	3,3
2015	2,5	3,7
2020	2,5	3,7
2025	2,5	3,7
2030	2,5	3,7
2035	2,5	3,7
2040	2,5	3,7
2045	2,5	3,7
2050	2,5	3,7
2055	2,5	3,7

It should be noted that the real increase in employment earnings is not equally distributed between men and women. In fact, the increase in average annual earnings is higher for women because of their higher levels of education, pay equity programs and an increase in the number of hours worked in a year. By 2040, the average real rate of increase in earnings is expected to be 1,4% for women, compared to 1,0% for men. After 2040, increases will be the same for both sexes.

3.4 Rates of return

Rates of return are determined for each year in the projection period and for each category of assets. Those rates reflect the projected return in the various financial markets.

Portfolio mix

The assets of the Plan are deposited in the Caisse de dépôt et placement du Québec. (CDP). The investment portfolio has three major divisions: fixed income securities, variable income stock market securities and over-the-counter variable income securities.

Fixed income securities include bonds, mortgage investments and short-term investments. Variable income stock market securities (traditional investments) include Canadian, U.S. and foreign stock shares and Québec International portfolio funds. The Québec International portfolio is characterized by the presence of bonds (in the form of underlying securities) and the constitution of a range of derivatives that functions as an international stock market index. Strategic management of the underlying bond holdings allows increased yields, compared with the yields of a portfolio consisting solely of international stock market securities.

Over-the-counter variable income securities (alternative investments) include private equity, real estate investments and hedge funds. Private equity offer expectations of a higher yield as compensation for a higher risk. For this actuarial analysis, the category of private equity includes the category called "investments and infrastructures", since its investment profile is similar to other private equity.

Hedge funds involve different financial strategies for the purpose of yielding a determined return and to reduce the aggregate exposure of the portfolio to risk.

Asset allocation

In May 2004, the Board of Directors at the Régie des rentes du Québec revised the policy entitled *Politique de placement du fonds du Régime de rentes du Québec*. This policy calls for a changeover to a new allocation of the Plan fund's assets beginning in 2005. Under the policy's, fixed income investments will account for 30% of the portfolio. The proportion of variable income stock market securities will be 42% and over-the-counter variable income securities will be 28%.

The investment policy grants managers of the CDP some degree of leeway with regard to departure from the actual asset allocation compared to these targets. However, for projection purposes, the anticipated allocation is based on these targets.

For this actuarial analysis, the asset allocation described above is maintained until 2015. Thereafter, a portion of the investment income is required to fund cash outflows. The portfolio mix is therefore changed over a period of 10 years to reduce its volatility and increase its degree of liquidity. At the end of this period, that is, in 2025, the target portfolio is comprised of the following: 40% in fixed income securities, 40% in stock market securities and 20% in over-the-counter securities.

The Plan will therefore require more than half of the investment income to cover its cash outflows. However, because funding for the Plan depends largely on future contributions, it is less vulnerable to yield fluctuations than a retirement plan that is more capitalized.

Therefore, the distribution of the asset portfolio remains focused on long-term growth. Changes to this distribution are shown in Table 24.

Table 24
Distribution of the Plan's fund assets

CATEGORIES OF ASSETS	2004	2005 TO 2015	2025 AND LATER
	%	%	%
Bonds and mortgages	29	29	37
Short-term investments	3	1	3
Canadian equity	17	15	15
U.S. equity	7	5	5
Foreign equity	7	5	5
Québec International	16	17	15
Private equity	9	10	5
Real estate investments	10	13	10
Hedge funds	2	5	5

Determining assumptions on the rate of return by asset category

Yields on fixed income assets (bonds and mortgages) include coupon income and appreciation of asset fair values based on interest rate variations.

Yields on variable income assets include dividend income (for stock shares) or rental income (from buildings) and appreciation of the asset fair values. No distinction is made between earned and unearned income resulting from appreciation of the fair value.

One of the approaches used to determine the rates of return for the various investment types is the history of past yields over long periods. For equity, data from Canadian, U.S. and international stock market indexes were used.

For fixed income investments, the historical rates of return for Canadian government bonds, provincial and corporate bonds and mortgages were used as the basis of making a yield assumption. In the case of bonds, the analysis of past yields is taken into account by examining differences in the yields of these securities based on different maturity dates.

The real rate of return for variable income securities is kept constant throughout the projection period. Bonds, mortgages and short-term securities are on the increase during the first five years. A more modest short-term yield projection for fixed income securities reflects the anticipated increase in interest rates in the years to come.

Use of a stable rate of return for variable income securities reflects the difficulty in predicting financial market returns year after year, since they are the subject of significant volatility.

In addition to past rates of return, the impact that an aging population may have on the financial markets was considered when determining rates of return by asset category (primarily for variable income securities). In fact, as of 2010, the baby boom generation will leave the savings phase and enter the retirement phase, thereby affecting capital supply and demand. Moreover, the transition of baby boomers to retirement in industrialized countries will put considerable pressure on the labour market. In some countries, this will mean a decrease in the working-age population. The anticipated decrease in manpower could affect economic growth in some countries.

Another approach was used to determine assumptions on the rate of return, namely the analysis of differences in yield between asset categories. This method led to the following results:

- The projected average rate of return for the bond and mortgage portfolio is 3,4%. This is based on an average actual yield over 50 years of long-term federal bonds and on the historical analysis of securities that comprise this portfolio according to type and maturity, as indicated above. This rate is the point of reference that enables us to determine the risk premium of the other categories below.

- The projected actual yield for short-term securities is estimated to be 1,2% less than the assumption made for bonds. Therefore the projected actual average yield is 2,2%.

- For Canadian stock shares, a risk premium of 2,1% (beyond the rate of return for long-term bonds) is projected. This premium represents the additional yield expected by investors to offset the higher risk associated with the Canadian bond market.

- Yield assumptions for U.S. and foreign stock shares have a risk premium of 2,4% (beyond the rate of return for long-term bonds). This yield is 0,3% higher than the yield for Canadian stock shares.

- The yield assumption for the Québec International portfolio is obtained by using the average yield assumptions for U.S. and foreign stock shares, increased by 0,7% to translate the growth in yield attributed to management of the debt security in this portfolio. The risk premium is therefore 3,1% (beyond the rate of return for long-term bonds).

- The yield assumption for private market investments involves a premium of 3,4% (beyond the rate of return on long-term bonds). The 1% higher yield than U.S. and foreign stock shares is due to the higher risk, the lack of liquidity and the long-term horizon for this type of investment.

Table 25 shows the real rates of return (excluding inflation) for each asset category.

Management fees

Management fees for investments are deducted directly from investment income in order to obtain the net rate of return after fees. A reduction of 0,27 percentage points on the absolute value of gross yields was assumed throughout the entire projection period. This value, attributed to management fees, corresponds to the average between statistics from recent years and a lower level in the long term. This drop is the result of the anticipated accrual of funds managed by the CDP.

Overall rate of return

The overall rate of return assumption stems from a combination of different rates of return according to asset category and the projected distribution of assets.

Table 26 illustrates the assumption of the aggregate rate of return on Plan assets during the projection period after deduction of fees for investment. Nominal rates (including inflation) and real rates (excluding inflation) are shown.

Table 25
Real rate of return by investment type

YEAR	BONDS AND MORTGAGES	SHORT-TERM INVESTMENTS	CANADIAN EQUITY	U.S. EQUITY	FOREIGN EQUITY	QUÉBEC INTERNATIONAL	PRIVATE EQUITY	REAL ESTATE INVESTMENTS	HEDGE FUNDS
	%	%	%	%	%	%	%	%	%
2004	2,0	1,0	5,5	5,8	5,8	6,5	6,8	5,6	4,9
2005	2,3	1,2	5,5	5,8	5,8	6,5	6,8	5,6	4,9
2006	2,6	1,4	5,5	5,8	5,8	6,5	6,8	5,6	4,9
2007	2,9	1,7	5,5	5,8	5,8	6,5	6,8	5,6	4,9
2008	3,2	2,0	5,5	5,8	5,8	6,5	6,8	5,6	4,9
2009 +	3,5	2,3	5,5	5,8	5,8	6,5	6,8	5,6	4,9
Average rate	3,4	2,2	5,5	5,8	5,8	6,5	6,8	5,6	4,9

Table 26
Rate of return on Plan assets, after deducting management fees

YEAR	NOMINAL RATE	REAL RATE
	%	%
2004	5,9	4,4
2005	6,4	4,6
2006	6,6	4,7
2007	6,8	4,8
2008	6,8	4,8
2009	6,9	4,9
2010	7,0	4,9
2015	7,4	4,9
2020	7,3	4,8
2025	7,1	4,6
2030	7,1	4,6
2035	7,1	4,6
2040	7,1	4,6
2045	7,1	4,6
2050	7,1	4,6
2055	7,1	4,6

4. Plan contributions

The amount of Plan contributions depends on the number of contributors, their contributory earnings and the contribution rate. Thus, the demographic and economic assumptions described in the preceding sections will affect the level of future contributions.

For the purpose of projecting cash inflows, the amount of contributions is determined on an accrual basis of accounting, that is, they are charged to the year in which they are payable, whether or not they are disbursed during the year. Therefore, the amounts determined in the actuarial analysis differ from accounting data included in financial statements, which are compiled according to the actual date on which they are received.

4.1 Determining Plan participation

Generally speaking, all persons age 18 and over whose annual employment income exceeds the basic exemption (3 500 $) contribute to the Plan. The number of persons who contribute to the Québec Pension Plan is therefore strongly correlated with the level of employment identified in section 3.1 as “employed persons”. A person who is unemployed or economically inactive for several months during a year may, nevertheless, have sufficient employment income to contribute to the Plan.

More specifically, the number of contributors to the Plan is determined, by sex and by age, by starting with the relationship between the number of employed persons and the number of persons with employment earnings greater than the basic exemption. That calculation requires a distribution of workers according to their employment earnings as found in the Plan’s Record of Contributors. Since the basic exemption is set at 3 500 $, the annual increase in workers’ earnings results in an increase in Plan participation.

Table 27 shows the results of projecting Plan participation, that is, participation rates (the ratio of the number of contributors to the population aged 18 to 69)[13] and the number of contributors by sex. The participation rates for men and for women tend to come together, as shown in the table. Table 28 shows participation rates by sex and by age group.

13. Since 1998, workers contribute to the Plan even if they receive a retirement pension. Some contributors may therefore be over age 69.

Table 27
Plan participation by sex
(population aged 18 to 69)

	PARTICIPATION RATE		NUMBER OF CONTRIBUTORS (in thousands)		
YEAR	MEN	WOMEN	MEN	WOMEN	TOTAL
	%	%			
2004	74	64	1 967	1 682	3 649
2005	74	65	1 983	1 712	3 695
2006	75	65	2 005	1 733	3 738
2007	75	65	2 024	1 753	3 778
2008	75	66	2 042	1 772	3 814
2009	75	66	2 057	1 787	3 844
2010	75	66	2 070	1 802	3 872
2015	75	67	2 110	1 844	3 954
2020	76	68	2 105	1 853	3 958
2025	76	69	2 072	1 828	3 899
2030	77	71	2 039	1 818	3 857
2035	78	72	2 033	1 820	3 852
2040	79	73	2 032	1 826	3 858
2045	79	73	2 016	1 817	3 832
2050	79	74	1 994	1 802	3 796
2055	80	75	1 973	1 785	3 758

Table 28
Plan participation rates for the purpose of calculating contributions, by age and by sex

	MEN			WOMEN		
AGE GROUP	2004	2030	2055	2004	2030	2055
	%	%	%	%	%	%
20 to 24	76	79	81	73	73	75
25 to 29	81	90	92	75	87	89
30 to 34	82	93	93	74	86	86
35 to 39	83	90	90	75	83	83
40 to 44	85	91	92	77	85	86
45 to 49	83	91	90	76	85	84
50 to 54	80	85	87	69	81	83
55 to 59	72	79	87	52	75	82
60 to 64	44	53	61	25	49	58
65 to 69	17	15	20	8	11	17
All ages	74	77	80	64	71	75

4.2 Calculation of contributory earnings

Contributory earnings are employment earnings that fall between the basic exemption and maximum pensionable earnings (MPE). The MPE is the upper limit of the earnings taken into account under the Plan for calculating contributions and benefits. The MPE, which was 40 500 $ in 2004, increases according to changes in the average weekly wage in Canada, that is, at the same rhythm as the average employment earnings of all workers (see section 3.3).

Average employment earnings projected by sex and by age group were adjusted in two ways to obtain the average pensionable earnings. First, they were reduced to take into account the fact that pensionable earnings under the Plan cannot exceed the MPE. Second, they were slightly increased because the earnings of workers who earned less than the basic exemption were excluded from the average that is used. Contributory earnings are equal to the average pensionable earnings from which the basic exemption has been subtracted.

These adjustments are made by taking into account the distribution of workers according to their earnings, that is, the proportion of workers in each earnings bracket and the total payroll attributed to each bracket.

Table 29 shows changes in average employment earnings and average pensionable earnings by sex and the MPE. The projection method for average earnings takes into account the effect of the change in the demographic structure and the more rapid increase in women's earnings, compared to men's earnings.

Thus the ratio of average pensionable earnings for women to those of men increased from 71,1% in 1966 to 84,3% in 2004 and will reach 90,8% in 2050. Table 30, shows average employment earnings by age and by sex in 2004, 2030 and 2055.

Table 31 shows average employment earnings by age and by sex. As mentioned earlier, pensionable earnings are average employment earnings up to the MPE limit.

Table 29
Average employment earnings by sex, average pensionable earnings by sex and the MPE

	AVERAGE EMPLOYMENT EARNINGS		AVERAGE PENSIONABLE EARNINGS		
YEAR	MEN	WOMEN	MEN	WOMEN	MAXIMUM PENSIONABLE EARNINGS (MPE)
	$	$	$	$	$
2004	38 029	26 003	28 139	23 726	40 500
2005	38 875	26 753	28 623	24 243	41 100
2006	39 852	27 561	29 253	24 848	42 000
2007	40 932	28 450	29 989	25 536	43 100
2008	42 083	29 396	30 775	26 273	44 300
2009	43 308	30 403	31 622	27 056	45 600
2010	44 659	31 502	32 576	27 934	47 100
2015	52 718	38 163	38 279	33 221	55 800
2020	62 612	46 513	45 548	39 968	67 000
2025	74 329	56 638	54 003	47 917	80 300
2030	88 358	68 904	64 093	57 403	96 400
2035	104 963	83 778	76 024	68 796	115 600
2040	125 356	101 069	90 363	82 190	138 600
2045	150 340	121 223	107 848	98 075	166 200
2050	180 400	145 283	128 859	117 090	199 300
2055	216 411	174 160	153 886	139 783	239 000

Table 30
Average employment earnings by age and by sex

	MEN			WOMEN		
AGE GROUP	2004	2030	2055	2004	2030	2055
	$	$	$	$	$	$
20 to 24	16 411	37 687	93 220	13 298	32 034	79 237
25 to 29	28 687	65 880	162 956	22 721	55 857	138 512
30 to 34	36 812	84 540	209 111	27 146	68 357	172 516
35 to 39	42 483	97 563	241 324	29 859	76 273	193 059
40 to 44	46 587	106 987	264 635	31 338	83 036	211 708
45 to 49	49 242	113 083	279 714	32 346	87 432	223 772
50 to 54	49 582	113 865	281 648	31 517	87 583	225 318
55 to 59	44 209	101 527	251 129	26 267	73 730	195 128
60 to 64	33 844	77 722	192 247	19 835	56 156	148 992
65 to 69	22 630	51 969	128 546	14 104	39 024	102 837
All ages	38 029	88 358	216 411	26 003	68 904	174 160

Table 31
Average pensionable earnings for the purpose of calculating contributions, by age and by sex

	MEN			WOMEN		
AGE GROUP	2004	2030	2055	2004	2030	2055
	$	$	$	$	$	$
20 to 24	16 769	36 577	88 494	14 083	31 676	76 496
25 to 29	26 278	59 428	145 218	22 763	53 171	129 945
30 to 34	29 559	67 645	165 825	24 970	59 721	147 312
35 to 39	30 929	71 578	175 732	26 033	63 214	156 351
40 to 44	31 815	74 056	181 981	26 852	66 480	165 142
45 to 49	32 373	75 437	185 436	27 405	68 147	169 543
50 to 54	32 194	74 276	182 332	27 017	66 727	166 047
55 to 59	29 797	67 278	163 870	24 152	59 871	150 654
60 to 64	25 637	54 944	129 902	20 611	49 790	123 875
65 to 69	20 779	40 205	87 293	17 635	37 680	88 269
All ages	28 139	64 093	153 886	23 726	57 403	139 783

4.3 Calculating contributions

Contributions to the Plan, for each age group of contributors and by sex, are the product of the following factors:

- population;
- Plan participation rate;
- average contributory earnings (average pensionable earnings less the basic exemption);
- the contribution rate of 9,9%, prescribed in the *Act respecting the Québec Pension Plan*.

The total amount of contributions is increased to take into account that some contributions are not refunded to employers. Such a situation occurs when a worker changes jobs, holds more than one job at the same time or where his or her total annual earnings are less than the basic exemption. The assumption for the increase is based on data provided by the Québec Ministère du Revenu. The amount of the adjustment was 139,7 million $ in 2004, that is, 1,71% of collected contributions. This percentage is reduced thereafter to take into account the effect of the freeze of the basic exemption.

The projection of contributions was completed by a downward adjustment to take into account costs related to contribution accounts receivable. The amount subtracted from contributions is estimated to be 3,1 million $ in 2004. The amount changes thereafter according to the rate of inflation.

5. Plan benefits

This section describes the method and assumptions used to project benefits. Determining the sums needed to pay benefits in coming years required two steps. First, we had to determine the sums needed to pay pensions already being paid on the date of this report. Then, we had to determine the sums needed for pensions that will begin being paid after that date. Sums needed for new pensions were determined according to benefit eligibility rates and the ratio of average pensionable earnings to the MPE.

For the projection of cash outflows, the sums are determined on the accrual basis of accounting, that is, they are charged to the year in which they are due, whether or not they are paid during the year. Therefore, the sums determined in the actuarial analysis differ from accounting data included in financial statements, which are compiled according to the actual date the sums are paid.

5.1 Projection of sums to pay pensions already being paid on the date of the report

For each benefit type payable as a pension, the number of beneficiaries and the average pension amount were determined at the valuation date, that is, 31 December 2003, by sex and by age group. To that data, obtained from Plan statistics, was added an estimate of the number of pensions payable at that date but whose payment had not yet begun (late applications or applications being processed and that will be granted retroactively).

For this actuarial analysis, additional adjustments were made to disability and surviving spouse's pensions, with respect to the number of beneficiaries and the amount of the average pension.

With regard to disability, the Ministère de l'Emploi, de la Solidarité sociale et de la Famille (MESSF) requested that a certain number of its allowance recipients with serious job constraints, all aged 60 and under, file an application so that the Régie could verify their eligibility for a disability benefit.

Through this measure, approximately 2 300 beneficiaries of the MESSF were added to the population of beneficiaries as at 31 December 2003. A downward adjustment was also made to the average amount of pensions to take into account the fact that these beneficiaries generally have a history of lower employment earnings.

With regard to the surviving spouse's pension, an adjustment to the population of beneficiaries as at 31 December 2003 was performed to reflect an amendment to the *Act respecting the Québec Pension Plan* in 2002 that granted eligibility to same-sex spouses and applied to deaths that had occurred between 4 April 1985 and 16 June 1999. Prior to this date, same-sex spouses could be eligible for a surviving spouse's pension only if the date of death of the deceased spouse had occurred on or after 16 June 1999, the date the status of de facto spouse was redefined in Québec laws.

Following this adjustment, slightly more than 400 people were added to the population of beneficiaries on 31 December 2003. The average amount of pensions was adjusted to take into account the fact that the contributor and beneficiary are the same sex. Generally speaking, when the deceased contributor is a man, the survivor's benefit paid to his beneficiary is higher than when the deceased contributor is a woman.

Table 32
Estimates of pensions payable as at 31 December 2003

BENEFIT TYPE	NUMBER OF BENEFICIARIES		AVERAGE MONTHLY BENEFIT	
	MEN	WOMEN	MEN	WOMEN
			$	$
Retirement pension	530 328	507 104	516,48	278,61
Surviving spouse's pension				
• Under age 65	17 330	67 607	549,16	625,25
• Age 65 and over	21 607	218 189	76,17	280,00
Disability pension	40 697	30 722	780,07	697,80

BENEFIT TYPE	NUMBER OF BENEFICIARIES	AVERAGE MONTHLY BENEFIT
	MEN AND WOMEN	MEN AND WOMEN
		$
Orphan's pension	19 950	59,28
Pension of a disabled person's child	10 543	59,28
Income security (welfare)	1 767	169,20

Table 32 shows estimates of pensions payable as at 31 December 2003, by pension type and by sex.

The projection of pensions being paid at the valuation date was made by taking into account the survival probabilities of beneficiaries, pension indexation and adjustments to reflect certain provisions of the *Act*. For example, where the beneficiary of a surviving spouse's pension retires, his or her pension must be recalculated by taking into account that a combined retirement-surviving spouse's pension may not exceed a certain maximum prescribed by law. The recalculation factor was determined on the basis of Plan statistics.

5.2 Calculating sums for new pensions: determining eligibility rates and the ratio of average pensionable earnings to the MPE

To calculate the number of new pensions, we had to determine the Plan participation rate of each population cohort. For the period from 1966 to 2001, the rates were based on the Record of Contributors, which contains participation information. For 2002 and subsequent years, the participation rates determined for projecting contributions were used and are described in section 4.1.

The calculation of average monthly pensions was based on average pensionable earnings. Here again, the data for 1966 to 2001 were used as well as the projected average pensionable earnings for subsequent years.

5.2.1 Adjustment to take into account the effect of partition of employment earnings and periods of disability

Generally, following the breakdown of a conjugal relationship, the earnings entered in the Record of Contributors are changed. Those earnings have a direct bearing on the pension amounts. However, the pensionable earnings projected to determine contributions do not take partition into account and must be adjusted.

Thus, the first step in calculating new pensions is to change the participation rates and the average pensionable earnings provided by the model so as to take into account the legislative provisions for partition of pension credits following a conjugal breakdown. Those provisions affect both the average pensionable earnings and the number of years of participation of each former spouse. The method used to evaluate the effect of the partition of earnings was to adjust the participation rates and the average employment earnings of each generation on the basis of the average effect of the partitions carried out between 1998 and 2002. In addition, for projection purposes, the adjustment was weighted according to the ratio of the number of projected partitions to the average number of partitions during the 5 years observed.

Table 33 shows the changes in the number of partitions projected for certain years in the projection period. That number takes into account the variation in the number of divorces,[14] which is affected by the drop in marriage rates and population aging as well as by the rate of renunciation of partition.

14. Of the different circumstances that may open the right to partition, divorce remains the most frequent.

Table 33
Changes in the number of partitions

YEAR	NUMBER OF PARTITIONS
2004	8 983
2005	8 932
2006	8 886
2007	8 841
2008	8 795
2009	8 758
2010	8 730
2015	8 626
2020	8 519
2025	8 335
2030	8 107
2035	7 951
2040	7 828
2045	7 664
2050	7 545
2055	7 484

Furthermore, beneficiaries of a disability pension do not contribute to the Plan. The absence of pensionable earnings during their period of disability should not result in a reduction of their career profile with respect to calculating other benefit types. Thus, participation rates were increased to reflect the prevalence of disability in the population.

Plan participation rates after adjustment for the purpose of calculating benefits are shown in Table 34 and average pensionable earnings adjusted for the same purpose are shown by age group and by sex in Table 35. Partition of earnings results in a greater increase in the participation rates for women than for men since women are more likely to obtain additional years of participation as the result of new earnings being entered in the Record of Contributors under their names.

Table 34
Plan participation rates after adjustment for the purpose of calculating benefits, by age and by sex

	MEN			WOMEN		
AGE GROUP	2004	2030	2055	2004	2030	2055
	%	%	%	%	%	%
20 to 24	76	79	81	73	73	75
25 to 29	82	90	92	77	88	90
30 to 34	83	94	94	77	88	89
35 to 39	84	91	92	78	85	86
40 to 44	86	92	93	80	87	88
45 to 49	85	93	92	78	87	87
50 to 54	82	88	89	72	84	86
55 to 59	76	82	90	55	79	87
60 to 64	53	61	69	31	55	65
All ages	82	89	91	72	83	86

Table 35
Average pensionable earnings after adjustment for the purpose of calculating benefits, by age and by sex

	MEN			WOMEN		
AGE GROUP	2004	2030	2055	2004	2030	2055
	$	$	$	$	$	$
20 to 24	16 931	36 934	89 358	14 295	32 138	77 592
25 to 29	26 403	59 737	145 991	23 366	54 454	132 934
30 to 34	29 444	67 472	165 467	25 858	61 644	151 845
35 to 39	30 628	71 002	174 424	26 997	65 344	161 372
40 to 44	31 594	73 634	181 021	27 417	67 763	168 186
45 to 49	32 220	75 142	184 786	27 754	68 947	171 419
50 to 54	32 108	74 126	182 056	27 319	67 387	167 536
55 to 59	29 850	67 396	164 212	24 368	60 398	151 866
60 to 64	26 270	56 298	133 100	21 059	50 877	126 583
All ages	28 982	66 284	160 776	24 852	60 199	148 142

5.2.2 Calculating eligibility rates

The adjusted participation rates were used to determine the eligibility rates of the population for each benefit type, that is, to determine the ratio of the number of eligible persons to the population. Eligibility rates were calculated for each of the years in the projection period, by sex and by age group.

Eligibility was calculated as a function of earnings during the contributory period. The period was adjusted to take into account certain provisions of the *Act*:

- Exclusion of the period during which a contributor received a disability pension;
- Exclusion of the period during which a beneficiary of family allowances had a dependent child under the age of 7 and during which earnings did not exceed the basic exemption;
- Subject to certain conditions, exclusion of the months during which an unreduced indemnity is paid under the *Act respecting industrial accidents and occupational diseases*, if the period exceeds 24 months.

The method used allowed several career profiles to be determined for a given generation. Thus, one portion of the generation worked during the entire contributory period, another portion had only one year with zero earnings, a third had 2 years and so on.

That method also allowed an adjustment of the career profiles for a given generation so as to reflect the fact that a contributor may have come in and gone out of the labour force several times. Such mobility is common for women who temporarily left the labour force to care for young children.

Years of participation were thus determined for each generation of contributors and for each career profile within each generation. For a given year, a generation's eligibility rate was obtained by adding together the eligible profiles in that generation. The eligibility rate was determined according to the conditions for granting each benefit. The global eligibility rate is the sum of the eligibility rates for each generation weighted by the number of individuals. Table 36 shows the eligibility rates for some of the benefit types, by year in the projection period and by sex. Because of migration, the number of persons eligible for a retirement pension is greater than the Québec population that reached retirement age.

Table 36
Eligibility rates for some benefit types, by sex

YEAR	PROPORTION OF THE POPULATION REACHING AGE 65 ELIGIBLE FOR A RETIREMENT PENSION		PROPORTION OF THE POPULATION REACHING AGE 65 GIVING ENTITLEMENT TO A DEATH BENEFIT	
	MEN	WOMEN	MEN	WOMEN
	%	%	%	%
2004	102	87	90	58
2005	102	89	90	60
2006	102	90	90	61
2007	102	91	91	63
2008	102	92	91	64
2009	102	93	91	65
2010	102	94	90	66
2015	102	96	87	73
2020	102	97	87	78
2025	102	99	87	81
2030	102	100	90	85
2035	102	100	89	84
2040	102	100	90	84
2045	102	100	91	86
2050	102	100	91	86
2055	102	101	92	87

YEAR	PROPORTION OF THE POPULATION AGED 20 TO 64 GIVING ENTITLEMENT TO A DEATH BENEFIT		PROPORTION OF THE POPULATION AGED 20 TO 64 ELIGIBLE FOR A DISABILITY PENSION	
	MEN	WOMEN	MEN	WOMEN
	%	%	%	%
2004	86	73	84	75
2005	86	73	84	75
2006	86	74	84	74
2007	87	75	84	75
2008	87	75	84	75
2009	87	76	84	75
2010	86	77	84	75
2015	87	78	83	76
2020	87	81	83	76
2025	88	82	84	78
2030	88	83	85	79
2035	89	83	85	80
2040	89	84	86	80
2045	90	84	86	81
2050	90	85	87	81
2055	90	85	87	81

5.2.3 Calculation of the ratio of average pensionable earnings to the MPE

The ratio of average pensionable earnings to the MPE was calculated, by sex and by age, for each year in the projection period. The method used is similar to the method used to calculate eligibility rates, except for the fact that it makes provisions for additional exclusions, namely:

- exclusion of the period during which a beneficiary of family allowances had a dependent child under the age of 7 and during which earnings were less than the average overall pensionable earnings after adjustment;
- exclusion of 15% of the months during which earnings were the lowest. This exclusion cannot, however, result in reducing participation to less than 120 months.

Calculated on an individual basis, the ratio would be 100% for a worker whose earnings reached the MPE in every year of his or her contributory period. The average of the ratios for a generation's various career profiles was used as a multiplier to determine the benefits level of that generation.

The average was determined for each benefit type. It represents the ratio of the average retirement pension to the maximum pension or, in the case of surviving spouse's pensions and disability pensions, the ratio of the average variable portion of the benefit to the maximum variable portion. Table 37 shows the ratio of the average retirement pension to the maximum retirement pension. The average retirement pension paid to new beneficiaries is determined on the basis of that ratio.

For men, the ratio decreases until 2025 and then remains stable at around 63%. The decrease is mainly related to lengthening of the contribution period. In fact, average pensionable earnings are calculated for an increasingly longer period until 2013, the first year in which it will be possible for the population aged 65 to have participated since age 18.

Since pensionable earnings at both beginning and end of career are usually lower and the number of years that can be excluded will be limited to 7 (for retirement at age 65), the average ratio of pensionable earnings to the MPE will decrease.

Table 37
Ratio of the average retirement pension to the maximum retirement pension

	IN THE POPULATION REACHING AGE 65	
YEAR	MEN	WOMEN
	%	%
2004	75	43
2005	75	44
2006	74	45
2007	74	46
2008	73	47
2009	73	47
2010	72	48
2015	69	50
2020	65	51
2025	63	51
2030	62	53
2035	62	52
2040	63	54
2045	64	56
2050	64	56
2055	64	57

In addition, the freeze of the basic exemption since 1998 results in a gradual increase in the number of contributors with very low earnings among future beneficiaries.

Although the effects also apply to women, the ratio of their average retirement pension to the maximum pension will increase during the projection period and will reach more than 50% around 2015. In fact, the significant increase in their participation in the Plan and their employment earnings have a greater impact than the phenomena described above.

The ratio of the average variable portion to the maximum variable portion, which is applicable for the other benefits, varies according to age and is generally higher because of more restrictive eligibility conditions.

Some changes were made to eligibility rates as well as to the ratio of adjusted average pensionable earnings to the MPE so as to adjust the results of the model to trends observed in recent years. Those adjustments are progressively removed over a certain number of years, which may vary depending on the type of benefit, except for retirement, where we had to take into account the beneficiaries who will apply for their retirement pensions from outside Québec. Since they are not counted in the Québec population, an adjustment had to be made for the entire projection period so as not to underestimate the number of future beneficiaries of a retirement pension.

5.3 Calculating sums needed for new disability pensions

The sums initially allocated to new disability pensions for each year are equal to the product of the following factors:

- the population of a given age group;
- that population's eligibility rate for a disability pension;
- the disability incidence rate[15] in the eligible population;
- the average pension, made up of a fixed portion and a variable portion based on average pensionable earnings.

Eligibility rates take into account the specific provisions applicable to each age group and reflect the broader eligibility conditions in effect since July 1993.

The eligibility rate for the 60-64 age group was reduced to take into account the fact that retirement pension beneficiaries are not entitled to a disability pension.

Since 1994, incidence rates among people under age 35 have been relatively stable. For women, aged 35 and over, the experience from 1994 to 2001 shows a 20 to 50% increase in incidence rates, depending on the 5-year age group. This increase can be attributed primarily to growth in the number of cases diagnosed with tumors, mental psychiatric disorders or musculoskeletal diseases.

15. By "disability incidence rate", we mean the proportion of eligible persons who become disabled in a given year. For the purposes of this report, the beginning of disability is the beginning of the period for which a monthly pension may be paid.

For men aged 35 to 59, data reveal a decrease from 2 to 15%, depending on the age group. The incidence among men aged 60 to 64, which is primarily the result of the application of broader criteria of disability, is relatively stable.

Following analysis of these data, incidence rates were determined on the basis of Plan statistics for the years 1999 to 2001.

Since 1 January 1986, a disability pension under the Québec Pension Plan is not paid for months during which a beneficiary receives an unreduced salary replacement indemnity paid under the *Act respecting industrial accidents and occupational diseases*. The reduction in disability incidence rates that is attributable to that provision is taken into account in the determination method for the rates described above.

Table 38 shows, for selected ages, the disability incidence rates used in this report. Table 39 shows the number of new beneficiaries of a disability pension and the average monthly amount of new pensions.

The sums allocated to new pensions are projected for each year following the beginning of payment, taking into account the survival probabilities for disabled persons and pension indexation.

The cessation rate for disability pensions depends on the disabled person's probability of recovery and death. It is based on Plan statistics for 1997 to 2001 and varies according to the beneficiary's age and the duration of the disability. However, as of the 6th year of disability, the rate varies only according to the beneficiary's age. Table 40 shows the cessation rate of disability pensions for selected ages.

Table 38
Disability incidence rates
(by thousands)

AGE	MEN	WOMEN
22	0,16	0,07
27	0,23	0,20
32	0,38	0,31
37	0,63	0,85
42	1,07	1,42
47	1,94	2,29
52	3,64	3,73
57	7,02	5,32
60	60,79	41,77
61	19,05	13,18
62	18,32	13,86
63	16,63	13,66
64	7,60	5,10

Table 39
Projection of new disability pensions

YEAR	NUMBER OF BENEFICIARIES			AVERAGE MONTHLY AMOUNT	
	MEN	WOMEN	TOTAL	MEN	WOMEN
				$	$
2004	6 151	4 496	10 647	818,37	709,68
2005	6 315	4 565	10 880	832,23	726,28
2006	6 507	4 645	11 152	847,44	744,55
2007	6 649	4 747	11 396	863,80	763,68
2008	6 708	4 816	11 524	882,61	782,76
2009	6 826	4 928	11 754	903,09	804,02
2010	6 937	5 037	11 974	924,75	826,41
2015	7 439	5 462	12 901	1 058,44	973,41
2020	7 669	5 565	13 234	1 227,95	1 151,03
2025	7 296	5 396	12 692	1 430,73	1 337,87
2030	6 829	5 172	12 001	1 671,01	1 558,79
2035	7 031	5 311	12 342	1 971,46	1 834,92
2040	7 464	5 543	13 007	2 309,11	2 159,40
2045	7 246	5 426	12 672	2 701,59	2 534,13
2050	7 266	5 421	12 687	3 161,04	2 970,11
2055	7 089	5 289	12 378	3 711,64	3 484,77

Table 40
Cessation rates for disability pensions
(by thousands)

MEN						
AGE	1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	5th YEAR	6th YEAR AND LATER
30	120	100	80	62	47	32
40	136	95	62	41	32	28
50	151	102	66	46	36	30
60	41	31	25	24	30	0

WOMEN						
AGE	1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	5th YEAR	6th YEAR AND LATER
30	86	71	59	50	41	30
40	116	81	49	29	20	17
50	130	94	56	36	26	20
60	23	14	14	12	15	0

5.4 Calculating sums needed for new retirement pensions

The sums allocated for new retirement pensions were calculated on the basis of the number of new retirement pension beneficiaries in a given year and the average amount of their pensions.

5.4.1 Number of new retirement pension beneficiaries

The basic assumption for determining the number of new retirees during a given year is the retirement rate. That rate is determined by cohort for the ages from 60 to 70. For the purposes of this report, the retirement rate is not the probability that a person will retire at a given age. Instead, it represents the ratio between the number of persons who will become beneficiaries at a given age and the total number of persons eligible in the cohort group who are already beneficiaries or who will become beneficiaries.

The retirement rate was based on Plan experience from 1984 to 2002. Changes in the rate indicate that contributors will begin receiving a retirement pension earlier and earlier. A significant increase in the retirement rate for participants aged 60 was observed during the last decade. In fact in 1993, 43% of women and 35% of men began receiving a retirement pension at that age. In 2002, those proportions increased to 62% for women and 50% for men. At the same time, a drop in the average starting age for a retirement pension was observed. For men, it dropped from 62,3 in 1993 to 62,0 in 2002. For women, during the same period, it dropped from 62,0 to 61,5.

Changes in the retirement rate for subsequent years depend in part on the level of economic activity of the persons in the 60-64 age group. The increase in the activity rate for those persons, which is projected in this report, means that retirement rates will be different in future years.

Throughout the projection period, both for men and women, the largest group of retirees will be the age 60 group. Between 2010 and 2055, the size of that group will drop in comparison with the size of the other groups in the 61 to 65 interval.

Table 41 shows the retirement rates for cohorts reaching age 60 in 2004 and in 2055.

The number of new retirement pension beneficiaries for each cohort was determined on the basis of the retirement rate obtained, as indicated above, and on the basis of the following factors:

- total population;
- eligibility rate of that population for a retirement pension;
- number of disability pension beneficiaries who will reach age 65.

Table 41
Retirement rates

AGE	RETIREMENT RATE AT THE INDICATED AGE FOR A COHORT REACHING AGE 60 IN 2004		RETIREMENT RATE AT THE INDICATED AGE FOR A COHORT REACHING AGE 60 IN 2055	
	MEN	WOMEN	MEN	WOMEN
	%	%	%	%
60	49,7	61,6	42,8	50,8
61	6,6	5,8	7,0	5,7
62	4,7	3,9	5,4	3,7
63	3,7	3,0	4,9	2,7
64	3,0	2,8	4,8	2,4
65	30,4	21,4	33,2	33,2
66	0,7	0,4	0,7	0,4
67	0,4	0,2	0,4	0,2
68	0,2	0,1	0,2	0,1
69	0,1	0,1	0,1	0,1
70	0,5	0,7	0,5	0,7
Total	100,0	100,0	100,0	100,0

5.4.2 Average pension of new beneficiaries

The average pension of new beneficiaries at a given age is the result of the following factors:

- 25% of the average MPE for the year of retirement and the 4 preceding years;
- the ratio of the average pension to the maximum pension, which depends on the ratio of the average pensionable earnings to the MPE during the contributory period;
- the actuarial adjustment factor applicable at the age in question, that is, a decrease or increase of 0,5% a month where a person applies for a pension before or after age 65.

Disability pension beneficiaries who were declared to be disabled after 1998 and who reach age 65 receive a retirement pension that is reduced by an adjustment factor of 0,5% a month where a disability pension was paid between ages 60 and 65. The average retirement pension of those beneficiaries was adjusted accordingly.

Table 42 shows the number of new retirement pension beneficiaries for selected years as well as the average monthly pension received by the new retirees.

Table 42
Projection of new retirement pensions

YEAR	NUMBER OF BENEFICIARIES			AVERAGE MONTHLY AMOUNT	
	MEN	WOMEN	TOTAL	MEN	WOMEN
				$	$
2004	38 455	38 166	76 621	474,04	288,67
2005	40 264	40 107	80 371	477,52	296,52
2006	42 558	42 547	85 105	480,93	306,03
2007	44 461	44 410	88 871	484,44	315,49
2008	45 709	45 684	91 393	492,98	327,76
2009	47 340	47 214	94 554	502,78	338,28
2010	48 566	48 392	96 958	513,01	351,71
2015	54 399	54 356	108 755	571,15	422,85
2020	59 955	59 587	119 542	657,51	516,85
2025	59 320	57 286	116 606	783,53	642,40
2030	52 609	49 785	102 394	934,89	779,25
2035	51 319	48 495	99 814	1 116,83	942,76
2040	55 840	52 790	108 630	1 373,39	1 169,95
2045	54 466	51 912	106 378	1 683,36	1 448,65
2050	53 606	52 173	105 779	1 992,87	1 728,13
2055	53 837	52 155	105 992	2 441,83	2 116,38

The sums allocated to new pensions are projected for each year that follows the beginning of payment, taking into account the survival probabilities for the beneficiaries and the indexation of pensions. The data on the survival of Plan beneficiaries show that retirement pension beneficiaries have a lower mortality rate than the rate for the overall population, except for men aged 70 and over, whose rate is about the same.

The survival probabilities for retirement pension beneficiaries were determined by starting from the probabilities for the overall population. However, the corresponding mortality rates were adjusted downwards in accordance with Plan data.

The effect of these adjustments decrease over time, as the number of persons entitled to a retirement pension increases with respect to the population

Table 43 shows mortality rates for retirement pension beneficiaries, by age and by sex, for 2004, 2030 and 2055. The life expectancy for the same beneficiaries at selected ages, by sex, is shown in Table 44 for the same years. Life expectancy is determined without taking into account the reductions in mortality that are projected for years following the indicated year.

Table 43
Mortality rates for retirement pension beneficiaries
(by thousands)

	MEN			WOMEN		
AGE	2004	2030	2055	2004	2030	2055
60	7,6	5,6	4,5	4,3	3,6	3,0
65	15,5	12,2	10,0	8,2	7,1	6,0
70	25,6	20,2	16,7	13,5	11,4	9,7
75	42,0	33,3	27,5	23,0	19,3	16,2
80	70,5	55,9	45,5	41,2	34,8	29,1
90	176,5	149,3	128,5	134,8	120,7	104,0
100	382,2	322,5	277,3	323,9	287,1	246,0

Table 44
Life expectancy for retirement pension beneficiaries

	MEN			WOMEN		
AGE	2004	2030	2055	2004	2030	2055
60	21,0	22,9	24,4	25,2	26,4	27,7
65	16,9	18,6	20,1	20,8	21,9	23,2
70	13,4	14,9	16,2	16,7	17,8	19,0
75	10,2	11,5	12,7	13,0	13,9	15,0
80	7,6	8,6	9,6	9,6	10,4	11,3
90	4,0	4,6	5,2	4,7	5,2	5,8
100	1,9	2,2	2,6	2,2	2,5	2,9

5.5 Calculation of sums needed for death benefits

The calculation of sums allocated to death benefits was made by taking the following factors into consideration:

- the number of deaths in the population;
- the eligibility rate of that population for a death benefit;
- the amount of the death benefit, which is set at 2 500 $.

Table 45 shows the results of projecting the number of beneficiaries of a death benefit according to the sex of the deceased contributor.

Table 45
Projection of death benefits, according to the sex of the deceased contributor

	NUMBER OF BENEFICIARIES		
YEAR	MEN	WOMEN	TOTAL
2004	25 800	11 857	37 657
2005	26 249	12 406	38 655
2006	26 755	12 952	39 707
2007	27 290	13 525	40 815
2008	27 868	14 092	41 960
2009	28 511	14 690	43 201
2010	29 195	15 284	44 479
2015	32 486	18 447	50 933
2020	35 639	21 941	57 580
2025	38 819	25 826	64 645
2030	42 141	30 272	72 413
2035	45 202	35 118	80 320
2040	47 520	39 675	87 195
2045	48 822	43 055	91 877
2050	48 983	44 744	93 727
2055	48 300	44 637	92 937

5.6 Calculation of sums needed for new surviving spouse's pensions

Sums initially allocated to new surviving spouse's pensions for a given year were calculated on the basis of the following factors:

- the number of new surviving spouses in the year;
- the average monthly pension determined on the basis of the average pensionable earnings of the deceased contributors and, where the beneficiary is under age 65, of the fixed portion of the benefit.

5.6.1 Number of new surviving spouse's pensions in a given year

The number of new surviving spouse's pensions in a given year was determined according to the number of deaths in the population, the proportion of deceased contributors whose earnings were sufficient to give entitlement to a surviving spouse's pension and the proportion of contributors who were married at the time of death (Table 46). Data on that proportion were taken from the Plan's statistics for 2000 to 2002. That proportion takes into account the fact that persons living in a de facto conjugal relationship (including same-sex couples) may receive a surviving spouse's pension under specific conditions prescribed by law.

The proportion shown in Table 46 was kept constant throughout the entire projection period, on the basis of the following assumptions:

- Plan data on de facto unions are a reflection of data for the overall population of Québec;
- any future decrease in the proportion of legally married persons will be offset by an increase in the number of de facto unions.

The overall number of new surviving spouses was determined according to the estimated number of deceased contributors giving entitlement to a surviving spouse's pension. That number was then distributed among the new surviving spouses according to their ages in relation to the age of the contributor at death. That distribution model was based on Plan statistics from 1996 to 2002.

Table 46
Percentage of married contributors at the time of death

AGE GROUP	MEN	WOMEN
	%	%
20 to 24	7,0	10,0
25 to 29	13,5	20,9
30 to 34	35,6	52,3
35 to 39	46,7	62,3
40 to 44	49,7	66,6
45 to 49	58,5	64,9
50 to 54	61,4	64,8
55 to 59	67,2	60,9
60 to 64	70,1	57,7
65 to 69	70,1	46,8
70 to 74	71,0	39,8
75 to 79	68,9	26,6
80 to 84	62,6	16,7
85 to 89	51,1	7,9
90 to 94	37,9	3,4

5.6.2 Average amount of new surviving spouse's pensions

A surviving spouse's pension includes a variable portion, determined according to the deceased contributor's average pensionable earnings, and a fixed portion, if the new beneficiary is under age 65. The percentage applicable to the variable portion was determined as described in section 5.2.3 and varies according to the deceased contributor's age. The percentage is allocated to new surviving spouses according to the distribution by age mentioned in the preceding section.

For new beneficiaries aged 60 and over, the amount of a surviving spouse's pension is calculated differently, depending on whether the survivor is or is not receiving a retirement pension. The sums allocated to new surviving spouse's pensions depend on the following factors:

- the proportion of surviving spouses who are beneficiaries of a retirement pension and;
- the amount of the retirement pensions of surviving spouses, the amount of the retirement pensions of deceased contributors and the maximum amount of the retirement pension for a given year.

Some adjustments were made so that short-term results would be in line with Plan statistics for recent years. Another adjustment was made to the amount of new pensions in order to take into account situations where the contributor and beneficiary are the same sex.

Table 47 shows the results of projections related to new surviving spouse's pensions. As is the case for death benefits, the significant increase in the number of new beneficiaries between 2004 and 2055 is mainly because there will be an increase in the population aged 65 and over.

Sums allocated to new pensions are projected for each year following the beginning of payment, taking into account the survival probabilities of beneficiaries, pension indexation, adjustment of the amount of the fixed portion and the fact that pension amounts are recalculated when a beneficiary reaches age 65 or retires.

The survival probabilities for beneficiaries of a surviving spouse's pension are based on the survival probabilities of the population. Plan data on the survival of beneficiaries show that beneficiaries of this type of pension have a mortality rate that is higher than the rate of the general population. Thus, the mortality rates for the population are adjusted upwards to arrive at the mortality rates of beneficiaries.

Table 47
Projection of new surviving spouse's pensions

	NUMBER OF BENEFICIARIES			AVERAGE MONTHLY AMOUNT	
YEAR	UNDER AGE 65	AGE 65 AND OVER	TOTAL	BENEFICIARIES UNDER AGE 65	BENEFICIARIES AGED 65 AND OVER
				$	$
2004	6 973	12 522	19 495	584,45	278,84
2005	7 030	12 811	19 841	591,15	281,92
2006	7 098	13 123	20 221	597,39	282,39
2007	7 170	13 454	20 624	604,00	288,86
2008	7 243	13 803	21 046	611,69	293,96
2009	7 357	14 183	21 540	622,90	292,45
2010	7 467	14 570	22 037	637,26	297,57
2015	7 828	16 620	24 448	723,06	320,12
2020	7 924	18 900	26 824	829,90	350,76
2025	7 732	21 424	29 156	952,75	393,69
2030	7 358	23 952	31 310	1 098,02	446,93
2035	7 009	25 870	32 879	1 272,41	511,79
2040	6 789	26 810	33 599	1 477,69	590,85
2045	6 561	26 883	33 444	1 715,08	690,01
2050	6 242	26 383	32 625	1 989,43	815,74
2055	5 923	25 697	31 620	2 307,68	971,62

5.7 Calculation of sums needed for new orphan's pensions and pensions for children of disabled persons

The sums allocated for orphan's pensions and pensions for children of disabled persons were determined on the basis of the number of new beneficiaries and the amount of the benefit. In 2004, the benefit was 61,18 $, which is indexed annually.

The number of new beneficiaries of the orphan's pension and the pension for children of a disabled person (see Table 48) was determined on the basis of the following factors:

- the number of new beneficiaries of a surviving spouse's pension under age 65 and the number of new disability pension beneficiaries;
- the average number of children per surviving spouse and disabled person.

For the first year in the projection period, the average number of children was determined on the basis of Plan statistics. For subsequent years, the average is projected in accordance with the changes expected in the total fertility rate.

The number of new beneficiaries was distributed by age, according to Plan statistics, and then projected on the basis of a unisex survival table based on survival of the population. Pensions for children of disabled persons are terminated when the beneficiary reaches age 18.

Furthermore, in the case of pensions for children of disabled persons, the probabilities of cessation of the disability pension determined for each age group are taken into account.

Table 48
Projection of the number of new beneficiaries of orphan's pensions and pensions for children of disabled persons

YEAR	ORPHAN	CHILD OF A DISABLED PERSON
2004	2 848	2 286
2005	2 841	2 322
2006	2 809	2 329
2007	2 736	2 296
2008	2 684	2 284
2009	2 693	2 332
2010	2 696	2 360
2015	2 570	2 416
2020	2 433	2 422
2025	2 315	2 406
2030	2 205	2 399
2035	2 083	2 385
2040	1 965	2 353
2045	1 850	2 294
2050	1 749	2 268
2055	1 671	2 257

5.8 Calculating reimbursements to social assistance

The Régie makes reimbursements to the Ministère de l'Emploi, de la Solidarité sociale et de la Famille (MESSF) for beneficiaries of income security benefits (welfare). This is a closed group of people under age 65 who were receiving income security benefits on 31 December 1971 and who were either disabled or surviving spouses within the meaning of the Plan and did not necessarily meet all of the eligibility requirements.

The amount of the benefit reimbursed was equal to half of the benefit determined in accordance with Plan provisions that were in force at the time, up to a maximum equal to half of the income security benefit.

The number of beneficiaries and their distribution by benefit level were determined on the basis of statistics provided by the MESSF. Their projection by cohort takes into account the survival probability and the indexation of pensions used to valuate the Québec Pension Plan.

Reimbursements totalled 3,3 million $ in 2004 and covered 1 572 beneficiaries. It is expected that 2018 will be the last year in which social assistance benefits will be reimbursed to the MESSF for these beneficiaries.

6. Plan reserve

The reserve is the Plan's net assets, to which some adjustments have been made. At the end of each year in the projection period, the amount of the reserve was determined at its fair value and calculated in the following way: investment income and contributions are added to the amount of the reserve at the end of the preceding year, and then, benefits and administration costs are subtracted. The amount of benefits is determined by taking into account the administrative agreement between the Québec Pension Plan and the Canada Pension Plan for beneficiaries who contributed to both plans. The two plans compensate one another based on the participation of a beneficiary in each plan so that only one plan will pay a benefit. The plan that pays is determined by the beneficiary's place of residence when an application for benefits is filed.

The sections that follow describe the methods and assumptions used to determine the initial reserve, administration costs and investment income.

6.1 Initial reserve

The initial Plan reserve as at 31 December 2003 was determined on the basis of the fair value of the Québec Pension Plan Fund managed by the Caisse de dépôt et placement du Québec. That value mainly comprises participation deposit units. Table 49 shows the reconciliation used to determine the initial amount of the reserve.

The accounting method used by the Régie is similar to the cash basis of accounting, that is, cash inflows and outflows are not taken into account until they occur. However, the Plan's actuarial reports are made on the accrual basis of accounting and benefits are disbursed when they are encumbered and

contributions and investment income are entered in the year in which they become due.

6.2 Administration costs

Administration expenses fall into 2 categories: the Régie's expenses for administering the Plan and fees for the collection of contributions by the Québec Ministère du Revenu.

The Régie's administration expenses were estimated to be 76,5 million $ for 2004. From 2004 to 2008, administration expenses reflect budget forecasts. Thereafter, changes are based on the number of new beneficiaries and the inflation rate.

The fees for the collection of contributions are set under an agreement with the Ministère du Revenu. They were estimated to be 13,5 million $ in 2004 and change thereafter on the basis of inflation, as provided in the agreement.

Administration and collection costs account for 1,2% of the Plan's cash outflows in 2004 and 0,8% in 2055.

6.3 Investment income

Projections of investment income were made by using the rate of return after deduction of investment management expenses, as described in section 3.4 of this appendix. This rate is applied to the Plan reserve as well as to the cash inflows and outflows for each year in the projection period, based on their monthly distribution. The investment income thus calculated includes both the income paid to the Régie by the Caisse de dépôt and variations in the fair value of reserve investments.

Table 49
Plan reserve as at 31 December 2003
(in millions of $)

Plan assets in the Caisse de dépôt et placement as at 31 December 2003 (including receivable investment income)	18 753,4
PLUS:	
Contributions due in 2001, 2002 and 2003 but collected in 2004	847,2
LESS:	
Benefits owing in 2003 but paid in 2004	131,9
Sums owing to the Canada Pension Plan	20,9
Plan reserve as at 31 December 2003	19 447,8

Appendix IV

Reserve projection based on the steady-state contribution rate

1. Introduction

This appendix shows changes in the Plan's reserve based on the contribution rate that corresponds to the steady-state contribution rate, as defined in section 2 of the actuarial report. This projection is presented for information purposes only, since the contribution rate is fixed at 9,9% under the *Act respecting the Québec Pension Plan*, and is a complement to information given in section 5.4.1 of the report.

2. Reserve projection based on the steady-state contribution rate

In this appendix, the projections of the actuarial analysis have been adjusted to simulate a change in which the contribution rate is set at 10,3% as of 2005. Tables 50 and 51 show respectively, in current dollars and constant dollars from 2004, the Plan's cash inflows and outflows and the reserve for the period 2004 to 2055, based on this simulation.

Compared to projections of the analysis based on the statutory contribution rate of 9,9%, the projected contributions are much higher, as is investment income, and the reserve is consequently larger. The results, however, show no change to cash outflows.

Based on this simulation, although the steady-state contribution rate helps to stabilize the ratio of the reserve to cash outflows for the following year between 2040 and 2055, the reserve expressed in dollars continues to grow.

Table 50

Reserve projection (contribution rate of 10,3% as of 2005)
(in millions of current dollars)

	CASH INFLOWS			CASH OUTFLOWS			RESERVE		
YEAR	CONTRI-BUTIONS	INVESTMENT INCOME	TOTAL	BENEFITS	ADMINIS-TRATION EXPENSES	TOTAL		IN PROPORTION TO CASH OUTFLOWS FOR THE FOLLOWING YEAR	PAY-AS-YOU-GO CONTRIBU-TION RATE
	$	$	$	$	$	$	$		%
2004	8 303	1 165	9 467	7 548	90	7 638	21 277	2,7	9,1
2005	8 934	1 384	10 318	7 870	101	7 970	23 625	2,8	9,2
2006	9 276	1 578	10 854	8 229	113	8 342	26 137	3,0	9,3
2007	9 652	1 793	11 445	8 611	120	8 731	28 850	3,2	9,3
2008	10 045	2 001	12 047	9 024	122	9 146	31 751	3,3	9,4
2009	10 450	2 227	12 677	9 472	129	9 600	34 827	3,5	9,5
2010	10 893	2 475	13 368	9 948	134	10 082	38 113	3,6	9,5
2011	11 343	2 742	14 085	10 451	140	10 591	41 607	3,7	9,6
2012	11 822	3 031	14 853	10 985	146	11 131	45 329	3,9	9,7
2013	12 332	3 344	15 676	11 557	153	11 710	49 295	4,0	9,8
2014	12 858	3 681	16 539	12 173	161	12 334	53 499	4,1	9,9
2015	13 382	3 988	17 370	12 837	167	13 004	57 865	4,2	10,0
2020	16 276	5 562	21 838	16 673	206	16 880	81 689	4,6	10,7
2025	19 361	7 163	26 524	21 378	236	21 614	106 545	4,7	11,5
2030	23 071	8 910	31 981	26 360	267	26 627	132 128	4,8	11,9
2035	27 709	10 966	38 675	31 666	312	31 978	162 663	4,9	11,9
2040	33 305	13 526	46 831	38 352	382	38 733	200 556	5,0	12,0
2045	39 737	16 498	56 235	46 622	432	47 054	244 238	5,0	12,2
2050	47 262	19 911	67 174	56 018	505	56 523	294 538	5,0	12,3
2055	56 123	23 767	79 889	67 674	578	68 252	350 974	5,0	12,5

Table 51

Reserve projection (contribution rate of 10,3% as of 2005)
(in millions of constant dollars)

	CASH INFLOWS			CASH OUTFLOWS				
YEAR	CONTRI-BUTIONS	INVESTMENT INCOME	TOTAL	BENEFITS	ADMINISTRATION EXPENSES	TOTAL	RESERVE*	PAY-AS-YOU-GO CONTRIBUTION RATE
	$	$	$	$	$	$	$	%
2004	8 303	1 165	9 467	7 548	90	7 638	21 277	9,1
2005	8 802	1 363	10 165	7 753	99	7 852	23 276	9,2
2006	8 978	1 527	10 505	7 964	110	8 073	25 295	9,3
2007	9 167	1 703	10 870	8 178	114	8 292	27 401	9,3
2008	9 353	1 864	11 217	8 402	114	8 516	29 564	9,4
2009	9 539	2 033	11 572	8 646	118	8 764	31 793	9,5
2010	9 749	2 215	11 964	8 903	120	9 023	34 110	9,5
2011	9 943	2 404	12 347	9 161	123	9 284	36 471	9,6
2012	10 140	2 600	12 740	9 422	125	9 547	38 878	9,7
2013	10 340	2 803	13 143	9 690	128	9 818	41 329	9,8
2014	10 528	3 014	13 541	9 967	132	10 099	43 803	9,9
2015	10 690	3 186	13 875	10 254	134	10 388	46 222	10,0
2020	11 491	3 927	15 418	11 772	146	11 917	57 674	10,7
2025	12 082	4 470	16 551	13 341	147	13 488	66 486	11,5
2030	12 725	4 914	17 639	14 539	147	14 686	72 874	11,9
2035	13 508	5 346	18 853	15 436	152	15 589	79 295	11,9
2040	14 350	5 828	20 178	16 524	164	16 689	86 412	12,0
2045	15 133	6 283	21 416	17 755	165	17 919	93 011	12,2
2050	15 908	6 702	22 610	18 855	170	19 025	99 138	12,3
2055	16 696	7 070	23 767	20 133	172	20 305	104 413	12,5

* After conversion into constant dollars, the reserve for a given year is no longer exactly equal to the reserve from the previous year, to which is added the net total of cash inflows and outflows for the current year.

Appendix V

Sensitivity tests on the results

1. Introduction

Since all projections have a degree of uncertainty, sensitivity tests were conducted on the results. Those tests were used to measure the changes in the results that would be caused if changes in an assumption were different than that made in the report. The tests were limited to the main demographic and economic variables.

Eight assumptions were the object of sensitivity tests. Three tests pertain to demographic assumptions, that is, fertility, net migration and mortality reduction over time. Five tests pertain to economic assumptions, namely activity rate, employment, inflation rate, real rate of increase in average employment earnings and real rate of return on investments.

Two tests were conducted for each assumption. The first evaluated the effect on the results of changes less favourable for the Plan than those used in the actuarial report and the second evaluated the effect of more favourable changes. The variations in assumptions tested represent a difference considered to be significant with respect to the assumptions made in the actuarial report without, however, being the upper and lower limits of a probable interval of change for each variable.

For each test, two indicators are given. Comparison between the value of these two indicators during tests and in the actuarial analysis indicates to what degree the results are sensitive to each change of assumption. These indicators are as follows:

- the **ratio of the Plan reserve to the cash outflows for the following year**. As with the actuarial report, the ratio was determined on the basis of the provisions for benefits and the contribution rate of 9,9% provided for in the *Act*.
- the steady-state **contribution rate**, that is, the rate[16] that would enable the ratio of the reserve to cash outflows from 2040 to 2055 to remain constant.

A less favourable change in an assumption (test I) gives a weaker ratio of the Plan reserve to cash outflows for the following year than the one in the report and consequently, an increase of the steady-state contribution rate. A more favourable change (test II) has the opposite effect.

The difference between the steady-state contribution rate of a particular test and the rate of 10,30% for the actuarial analysis represents an estimate of the adjustment to the contribution rate that would be required to compensate for the effect caused by the change of assumption.

It should be noted that the effect observed in a test cannot be combined with the effect of one or several other tests because among the assumptions there are several interrelations that could reduce or increase the effect of the tests. Therefore, the cumulative effect of two or more variations in the assumptions would not necessarily be equivalent to the sum of the effects taken separately.

In the report, the projected ratio of the Plan reserve to cash outflows for the following year is small in 2055. Therefore, in the sensitivity tests, all of the results obtained by retaining a less favourable change for an assumption indicate a depletion of the reserve before 2055. Should such a situation occur, adjustments must be made to the provisions of the Plan and its contribution rate.

Two synoptic tables are found at the end of this appendix. Table 52 shows for each

16. The purposes of this analysis, the steady-state contribution rate was applied as of 2005.

assumption, the changes of assumptions used to test the sensitivity of the results. Table 53 shows the steady-state contribution rate that would result in maintaining a constant reserve to cash outflows ratio between 2040 and 2055 for the different sensitivity tests.

2. Sensitivity tests on the results of changes in the demographic assumptions

2.1 Fertility

In this report, the total fertility rate, which represents fertility for a given year, will increase from 1,47 children per woman in 2004 to 1,60 in 2015 and remain constant thereafter.

A variation in the fertility rate and, consequently, in the number of births, results in a change in the number of new Plan contributors around 20 years later. Thus, the effect of a variation in fertility on the reserve can be observed only in the long term.

In the first test, the rate is lower than in the report. It was set at 1,40 in 2005. In the second test, the increase in the rate is more rapid and greater than in the report. It reaches 1,80 in 2015 and remains constant thereafter. Compared with the report, the number of births declines (test I) or increases (test II) and in both cases the trend grows until 2015. From 2015 to 2030, this variation is approximately 10 000 births per year in both tests. The number of new contributors reflects the changes around 20 years later. In 2055, the cumulative effect of the fertility rate results in a reduction of 6,6% in the number of contributors in the first test and an increase of 6,2% in the second.

Changes in the reserve for each test, shown as the ratio of the Plan reserve to cash outflows for the following year, are shown in Table 52. In the first test, the reserve is depleted in 2055. In the second test, the ratio of the reserve to cash outflows for the following year therefore increases by 0,8, and is 1,6 in 2055.

In the test in which fertility is lowest, the steady-state contribution rate is set at 10,47%, representing a 0,17 increase over the rate of 10,30% in the report. In the test in which fertility is the highest, the contribution rate would be 10,16%, which would be 0,14 lower than in the report.

Table 52
Sensitivity tests: fertility

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER FERTILITY)	REPORT	TEST II (HIGHER FERTILITY)
2005	2,8	2,8	2,8
2015	3,7	3,7	3,7
2025	3,7	3,7	3,7
2035	3,1	3,1	3,2
2045	1,9	2,2	2,5
2055	-	0,8	1,6

2.2 Net migration

In the report, there is an assumption for in-migration and out-migration for each calendar year. The net migration was 0,25% of the Québec population in 2004, that is, 18 500 persons. Net migration will increase gradually as of 2010 until it reaches 23 000 and remains constant thereafter. The net migration tests used variations in the net migration level during the projection period. The first consequence for the Plan is a change in the number of new contributors. Over a longer term, the number of beneficiaries also changes.

In the first test, net migration declines, reaching 15 500 people as of 2006 and remains at this level during the projection period. In the second test, in-migration increases more rapidly, resulting in a net migration of 30 500 people in 2015 and remaining constant thereafter. According to the first sensitivity test, the population declines by 5,8% in 2055, compared with the report. In the second test, the population increases by 5,2%. The number of contributors decreases by 6,6% in 2055 in the first test, but increases by 6,1% in the second.

The effect of these tests on the reserve, expressed as the ratio of the reserve to cash outflows for the following year, is shown in Table 53. In the first test, the reserve is depleted in 2051. On the other hand, for a growing population, as assumed in the second test, the ratio of the reserve to cash outflows for the following year increases by 1,2 compared with the ratio in the report, reaching 2,0 in 2055.

The steady-state contribution rate would be 10,47%, for the test with the lower net migration, which would be an increase of 0,17 compared with the rate of 10,30% in the report. For the test with the higher net migration, the rate would be 10,16%, a drop of 0,14.

Table 53
Sensitivity tests: net migration

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER NET MIGRATION)	REPORT	TEST II (HIGHER NET MIGRATION)
2005	2,8	2,8	2,8
2015	3,7	3,7	3,7
2025	3,5	3,7	3,8
2035	2,6	3,1	3,5
2045	1,2	2,2	3,0
2055	-	0,8	2,0

2.3 Mortality reduction

The report was based on assumptions for mortality reductions for each age and calendar year. The mortality reduction results in an increase in life expectancy at age 65 for men, rising from 16,9 years in 2004 to 20,1 years in 2055 and for women, from 20,5 years to 23,2 years over the same period.

The mortality tests used variations in the level of mortality reduction during the projection period. A mortality reduction that is greater than the reduction used in the report results in increased life expectancy. Since that means that benefit payments would be made over a longer period, the aggregate benefit amount would increase. Similarly, a smaller reduction would reduce the aggregate benefit amount.

The first test assumed a mortality reduction equal to 175% of the value used in the report until 2030. On the other hand, the second test assumed a mortality reduction of 25% of the value used in the report until 2030. In both tests, the reduction for the years after 2030 is the same as that used in the report.

In the first test, life expectancy at age 65 in 2025 increases by approximately one year. Total benefits increase by 4,4% in 2055. In the second, life expectancy at age 65 in 2025 is reduced by approximately one year. The aggregate benefit amount in 2055 therefore decreases by 4,5%.

The effect of these tests, expressed as the ratio of the reserve to cash outflows for the following year, is shown in Table 54. Compared with the report, the first test results in a decline of the reserve. The reserve is depleted in 2051. In the second test, the ratio of the reserve to cash outflows for the following year increases from 0,8 to 2,8 in 2055.

The steady-state contribution rate is 10,55% for the greater mortality reduction test (test I), which represents a 0,25 increase over the rate of 10,30% in the report. For the smaller mortality reduction test (test II), the rate is 10,06%, a decrease of 0,24.

Table 54
Sensitivity tests: mortality reduction

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LONGER LIFE EXPECTANCY)	REPORT	TEST II (SHORTER LIFE EXPECTANCY)
2005	2,8	2,8	2,8
2015	3,7	3,7	3,8
2025	3,5	3,7	3,9
2035	2,6	3,1	3,7
2045	1,2	2,2	3,4
2055	-	0,8	2,8

3. Sensitivity tests on the results due to changes in the economic assumptions

3.1 Activity rates

In terms of activity, the actuarial report projects:

- a slight decline in activity rates until 2015 for people in the 15 to 24 age group, which are expected to stabilize thereafter;
- a gradual increase in the activity rates of people in the 25 to 64 age group. This increase levels off in different years, depending on the age group: in 2015 for the population aged 25 to 49, in 2020 for the 50 to 54 age group, and in 2055 for those aged 55 to 64;
- a decline in the activity rate for people aged 65 and over as the projected population continues to grow, that is, around 2030, followed by an increase up to the end of the projection period.

Despite an increase in activity rates based on age group and sex, the overall activity rate, namely the rate for the population aged 15 and over, declines between 2003 and 2055, due to an aging population. From 66,5% in 2003, the overall activity rate declines to 58,5% in 2030 and 57,5% in 2055.

In the first test, the activity is reduced. For people aged 15 to 24, the reduction is greater; it reaches a minimum in 2010 instead of 2015. For men aged 25 to 64, the gradual increase in activity rates ends in 2010. This is the element that accounts for most of the reduction of activity rates compared to rates established in the report. For men aged 65 and over, activity rates decline until 2030 and level off thereafter. Activity rates for women were determined by maintaining the

differences anticipated in the report between both sexes for each age group. The overall activity rate will be 1% lower than the rate anticipated in 2030, and the gap will grow, reaching 2% in 2055.

The second test assumes a higher rate of activity than in the report. Activity rates for men aged 15 to 24 are not reduced; rates from 2003 are maintained for the entire projection period. For men aged 25 to 64, the test assumes reaching the maximum values observed since 1976. For those in the 25 to 59 age group, this maximum value is reached in 2015, compared to 2025 for men aged 60 to 64. For men aged 65 and over, by 2030, the rates decline less than in the report. For women, this test generally assumes an additional reduction of 0,5 percentage point in the difference between activity rates for men and women compared to the report. The overall activity rate is 61,3% in 2030 and 59,6% in 2055, compared to 58,5% in 2030 and 57,5% in 2055 in the report.

A downward change in labour market participation (test I) affects employment because the rate of unemployment remains unchanged from the report. This decrease results in a reduction of the number of Plan contributors, and the aggregate amount of benefits over the longer term. An upward change in activity on the labour market (test II) has the opposite effect.

The effect of these tests is illustrated in Table 55. The reserve is depleted in 2055 in the test where activity on the labour market is lowest. The ratio of the reserve to cash outflows for the following year is 3,2 in 2055 for the test where activity is highest, compared to 0,8 in the report. The steady-state contribution rate is 10,41% in the first test, representing a 0,11 increase compared to the rate in the report. In the second test, it drops by 0,21, reaching 10,09%.

Table 55
Sensitivity tests: activity rates

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER ACTIVITY)	REPORT	TEST II (HIGHER ACTIVITY)
2005	2,8	2,8	2,8
2015	3,7	3,7	4,0
2025	3,6	3,7	4,3
2035	2,8	3,1	4,2
2045	1,7	2,2	3,9
2055	-	0,8	3,2

3.2 Employment

According to the actuarial report, employment will grow at an average rate of 1,0% between 2003 and 2010 and 0,1% between 2010 and 2020. Thereafter, it will decrease 0,4% between 2020 and 2030, 0,1% between 2030 and 2040 and 0,3% between 2040 and 2055. The level of employment will be 103 000 jobs lower in 2055 than in 2003. The unemployment rate will drop gradually from 9,1% in 2003, reaching its lower limit of 6,0% in 2018.

In the sensitivity tests on employment changes, activity rates remain the same as in the report. However, the unemployment rate is changed so the tests will have the desired employment changes. A downward change in employment has the main effect of reducing the number of contributors to the Plan as well as the aggregate amount of benefits, once these people reach retirement. An upward change has the opposite effect.

In the first test, the unemployment rate is higher than in the report and results in less favourable changes in employment levels. The unemployment rate falls from 9,1% in 2003 to 8,0% in 2015, then remains stable thereafter. From 2003 to 2010, employment increases by 0,8% on average. From 2010 to

2020, the average rate of increase in employment is nil. Thereafter, employment decreases at the same pace as in the report. This can be explained by the fact that the changes in the economically active population are identical to the changes in the report and that during the last 3 decades of the projection period, the unemployment rate is stable in the test and in the report. In 2055, there are 75 500 fewer jobs than in the actuarial report, representing 2% of the active population.

In the test with employment higher than in the report, the decline in unemployment is greater and more rapid. The unemployment rate reaches a lower limit of 4,0% in 2018. Employment increases somewhat more rapidly than in the report during the first 2 decades, at an average annual rate of 1,1% from 2003 to 2010 and 0,2% from 2010 to 2020. Thereafter, employment decreases at the same pace as in the report for the same reasons given for the less favourable test. In 2055, the test with higher employment shows 75 500 more jobs than in the report, that is, 2% of the active population.

The effect of these tests is shown in Table 56. In the first test, (lower employment), the reserve is depleted in 2053. In the second test (higher employment), the ratio of the reserve to cash outflows for the following year reaches 2,0 in 2055, compared to 0,8 in the report. The steady-state contribution rate is 10,41% in the first test and 10,20% in the second, which represents, respectively, an increase of 0,11 and decrease of 0,10 with respect to the rate of 10,30% in the report.

Table 56
Sensitivity tests: employment

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER EMPLOYMENT)	REPORT	TEST II (HIGHER EMPLOYMENT)
2005	2,8	2,8	2,8
2015	3,6	3,7	3,9
2025	3,4	3,7	4,0
2035	2,6	3,1	3,7
2045	1,4	2,2	3,1
2055	-	0,8	2,0

3.3 Inflation rate

The report projects an inflation rate of 1,5% in 2004. Thereafter, the inflation rate increases gradually to 2,0% in 2007, levels off until 2009, then increases again until 2014, reaching 2,5% and remaining at that level until the end of the projection period.

In the first test, the inflation rate is lower than in the report. It is 1,8% from 2005 to 2055. In the second test, the rise is more rapid and greater as of 2007. The inflation rate increases until 2013, reaching 3,2%. It remains at that level thereafter.

In the sensitivity tests for inflation, the assumptions for the real rate of increase in average employment earnings and the real rate of return on investments are the same as in the report. However, the nominal rates are adjusted.

An upward movement of inflation, compared with the assumption in the report has a direct effect on contributions, benefits and investment income:

- contributions are higher than in the report for two reasons: a nominal increase in average employment earnings and faster growth of the proportion of workers with incomes higher than the basic exemption (which is not indexed);
- the aggregate amount of benefits is also higher because of the higher indexation rate for pensions;
- investment income is also higher because of a higher nominal rate of return.

The combined effect of those factors is an increase in cash inflows (contributions and investment income) that is greater than the increase in cash outflows (benefits). A downward movement of the inflation rate has the opposite effect.

The effect of these tests is shown in Table 57. In the first test (lower inflation), the reserve is depleted in 2053. In the second test, (higher inflation), the ratio of the reserve to cash outflows for the following year is 2,3 in 2055, compared with 0,8 in the report. The steady-state contribution rate is 10,46% in the first test and 10,15% in the second, which represents, respectively, an increase of 0,16 and a decline of 0,15 compared with the rate of 10,30% in the report.

Table 57
Sensitivity tests: inflation rates

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER INFLATION)	REPORT	TEST II (HIGHER INFLATION)
2005	2,8	2,8	2,8
2015	3,7	3,7	3,8
2025	3,5	3,7	4,0
2035	2,6	3,1	3,7
2045	1,4	2,2	3,2
2055	-	0,8	2,3

3.4 Real rate of increase in average employment earnings

The report projects that the real rate of increase in employment earnings will climb from 0,4% in 2004 to 1,2% in 2010. The rate of increase will remain stable thereafter.

These tests consist of varying the real increase in average employment earnings. The projection of contributions is especially sensitive to variations in this assumption. In fact, a slight variation has a significant impact on a year's cash inflows, since the rate of increase is applied to a total payroll of several billion dollars and since the effect of a change for a given year affects the total payroll of subsequent years. Variations in this assumption also affect aggregate benefits, although less significantly since the variations will have only a gradual affect on new pensions.

The first test sets the real increase at 0,8%, reached in 2006, and the second test sets the real increase at 1,6%, reached in 2012. Thus, the first test reduces contributions in 2055 by 16,9% and aggregate benefits by 11,1%. On the other hand, the second test increases contributions by 19,7% and aggregate benefits by 12,2%.

The effect of these tests is illustrated in Table 58. In the first test, the reserve is depleted in 2047. In the second, the ratio of the reserve to cash outflows for the following year is 3,7 in 2055, compared to 0,8 in the report.

The steady-state contribution rate is 10,62% for the test in which the increase in average employment earnings is weakest (test I), that is, an increase of 0,32 compared with the rate of 10,30% in the report.

For the test in which the increase is higher (test II), the steady-state contribution rate is 10,00%, which represents a decrease of 0,30 compared to the rate in the report.

Table 58
Sensitivity tests:
real rate of increase in average employment earnings

	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
YEAR	TEST I (LOWER EARNINGS)	REPORT	TEST II (HIGHER EARNINGS)
2005	2,8	2,8	2,8
2015	3,6	3,7	3,8
2025	3,3	3,7	4,1
2035	2,1	3,1	4,1
2045	0,2	2,2	4,0
2055	-	0,8	3,7

3.5 Real rate of return on investments

The projected real rate of return on investments in the report is 4,4% in 2004. It increases gradually to 4,9%, then remains at this level from 2009 to 2015. Thereafter, it declines progressively until 2025, at which time it reaches its final level of 4,6%. Over the entire projection period (2004 to 2055), the average real rate of return is 4,7%.

Variations of this assumption have an immediate impact on income generated by the reserve. Contributions and aggregate benefits are not affected in any way.

The first test shows the effect of a variation of 0,5 percentage point drop in the real rate of return during the entire projection period and the second test shows the opposite effect, that is, a variation of 0,5 percentage point increase in the rate of return. Because of the cumulative effect of such changes on the reserve, in the first test, investment income decreases by 36% compared to the analysis in 2040. In the second test, investment income for the same year increases 47%.

Table 59 shows the ratio of the reserve to cash outflows for the following year. A decrease of 0,5% in the rate of return (test I) results in the depletion of the reserve in 2052. On the other hand, a 0,5% increase in the rate of return (test II) increases the ratio from 0,8 to 2,8 in 2055. The steady-state contribution rate is 10,55% in the first test and 10,07% in the second, which represents, respectively, a 0,25 increase and 0,23 decrease from the rate of 10,30% in the report.

Table 59
Sensitivity tests:
real rate of return

YEAR	RATIO OF THE RESERVE TO CASH OUTFLOWS FOR THE FOLLOWING YEAR		
	TEST I (LOWER YIELD)	REPORT	TEST II (HIGHER YIELD)
2005	2,8	2,8	2,8
2015	3,5	3,7	3,9
2025	3,3	3,7	4,2
2035	2,4	3,1	4,0
2045	1,2	2,2	3,6
2055	-	0,8	2,8

4. Summary

Table 60 shows for each assumption the variations used to test the sensitivity of the results. Table 61 shows the effect the tests have on the steady-state contribution rate. The steady-state contribution rate is defined in section 5.4.1 of the report.

The results of the sensitivity tests shown in Tables 52 to 59 of the preceding sections indicate that the level of the reserve is sensitive to the actuarial assumptions used. Since the projections must be made for a long period, any recurring variation in the difference between cash inflows and cash outflows can have a significant effect on the accumulated reserve in 2055. However, the sensitivity tests also show that a small, long-term adjustment in the contribution rate would usually completely offset the impact of such variations on the long-term level of the reserve.

Table 60
Variations used to test the sensitivity of the results

	TEST I (UNFAVOURABLE)	ASSUMPTIONS IN THE REPORT	TEST II (FAVOURABLE)
DEMOGRAPHIC			
Fertility (total fertility rate)	1,40 (2005)	1,60 (2015)	1,80 (2015)
Net migration	15 500 (2006)	23 000 (2010)	30 500 (2015)
Reduction in mortality (life expectancy at age 65)	2025 Men: 19,5 Women: 22,4	2025 Men: 18,3 Women: 21,6	2025 Men: 17,2 Women: 20,7
	2055 Men: 21,5 Women: 24,2	2055 Men: 20,1 Women : 23,2	2055 Men: 18,7 Women: 22,1
ECONOMIC			
Activity rate of persons aged 15 and over	2004 66,5% 2030 57,5% 2055 55,3%	2004 66,5% 2030 58,5% 2055 57,5%	2004 66,5% 2030 61,3% 2055 59,6%
Employment (unemployment rate)	8,0% (2018)	6,0% (2018)	4,0% (2018)
Inflation rate	1,8% (2005)	2,5% (2014)	3,2% (2013)
Real rate of increase in average employment earnings	0,8% (2006)	1,2% (2010)	1,6% (2012)
Real rate of return on investments	4,1% (2025)	4,6% (2025)	5,1% (2025)

A year in parenthesis indicates the time as of which the value shown remains constant thereafter.

Table 61
Effect of the various tests on the contribution rate

	TEST I (UNFAVOURABLE)	REPORT	TEST II (FAVOURABLE)
DEMOGRAPHIC			
Fertility	10,47%	10,30%	10,16%
Net migration	10,47%	10,30%	10,16%
Reduction in mortality	10,55%	10,30%	10,06%
ECONOMIC			
Activity rate	10,41%	10,30%	10,09%
Employment	10,41%	10,30%	10,20%
Inflation rate	10,46%	10,30%	10,15%
Real rate of increase in average employment earnings	10,62%	10,30%	10,00%
Real rate of return on investments	10,55%	10,30%	10,07%

Appendix VI

Comparison and reconciliation with the actuarial report as at 31 December 2000

1. Introduction

In this appendix, the projections made in the actuarial report as at 31 December 2000 are first compared with the operating results for the period from 2001 to 2003. They are then compared and reconciled with the projections in the actuarial report as at 31 December 2003.

2. Comparison of the projections in the actuarial report as at 31 December 2000 and the operating results

The projections made in the actuarial report as at 31 December 2000 were compared with the results published in the financial statements for the years 2001 to 2003. Those results were adjusted so that they could be presented on the same basis as those in the actuarial report, that is, by considering that sums are disbursed as soon as they are encumbered and received as soon as they are due. Table 62 shows the results of that comparison. Each element in the table is analysed in the following pages.

Table 62
Changes in the Plan reserve from 31 December 2000 to 31 December 2003
(in millions of dollars)

	OPERATING RESULTS (A)	PROJECTION IN THE ACTUARIAL REPORT OF 2000 (B)	DIFFERENCE (C) = (A) – (B)	DEVIATION (C) / (B)
	$	$	$	%
Reserve as at 31 December 2000	18 147,3	18 252,2	- 104,9	-0,6
CASH INFLOWS: 2001, 2002 AND 2003				
Contributions	21 860,7	21 504,9	355,8	1,7
Investment income (including capital gains)	-141,0	2 301,8	-2 442,9	-106,1
Total	21 719,7	23 806,7	-2 087,0	-8,8
CASH OUTFLOWS: 2001, 2002 AND 2003				
Administration costs	241,3	266,3	- 25,0	-9,4
Aggregate benefits	20 177,9	20 096,8	81,1	0,4
Total	20 419,2	20 363,1	56,1	0,3
Reserve as at 31 December 2003	19 447,8	21 695,8	-2 248,0	-10,4

2.1 Initial reserve

In the report as at 31 December 2000, the reserve at the beginning of the projection period was estimated to be 18,3 billion $. That sum was made up of the net assets of the Régie des rentes du Québec as at 31 December 2000 plus the estimated value of amounts due or receivable but not entered on the books as at 31 December 2000. The reserve as at 31 December 2000 has been corrected downward by 105 million $, a difference of -0,6% compared to the analysis projection for 2000. The difference is mainly the result of an overestimation of the contributions due for 2000 and collected in 2001.

2.2 Contributions

The contributions collected from 2001 to 2003 were 1,7% (355,8 million $) higher than the projection in the actuarial report as at 31 December 2000. This difference results mainly from the underestimation of the number of contributors. The number of contributors in 2003 is now estimated[17] to be 3 600 000, that is, 46 000 more than the number projected in the 2000 report.

The increase in contributors is mainly the result of the more rapid increase in activity rates. In fact, the average annual increase in the labour force was on average 2,3% for the years 2001 to 2003, while the projected increase was 0,8%. The number of new jobs was also higher than projected: the average annual increase in jobs was 2,0% from 2001 to 2003, instead of 0,9%.

Aggregate contributions also depend on the increase in the average contributory earnings. Table 63 shows the increase in earnings for the years 2001 to 2003. For the entire period, this increase is comparable to the increase projected in the 2000 report, although some factors that affect the increase in wages, in particular inflation and productivity have progressed differently. For 2003, the level of average contributory earnings is therefore comparable to that estimated in the 2000 report, that is, approximately 22 200 $.

Table 63
Rate of increase in employment earnings according to various measures

	2000 ACTUARIAL REPORT		OBSERVED OR ESTIMATED DATA			
				AVERAGE WEEKLY WAGE		
YEAR	AVERAGE ANNUAL WORKERS EARNINGS	AVERAGE ANNUAL CONTRIBUTORY EARNINGS	AVERAGE ANNUAL WORKERS EARNINGS	CANADA	QUÉBEC	AVERAGE ANNUAL CONTRIBUTORY EARNINGS
2001	2,0	2,1	1,9	1,8	1,9	0,5
2002	2,4	2,4	1,8[e]	2,0	2,7	4,1[e]
2003	2,6	2,7	2,2[e]	1,2	1,9	2,2[e]

17. Contributor data for a given year are not complete until several months after the year's end because of the processing of tax returns and validation of employer remittances by the Québec Ministère du Revenu.

Table 63 also compares the wage increase assumption in the 2000 report with various observed data on increases in employment earnings, including increases in the average weekly wage observed in Canada and Québec, as estimated by Statistics Canada. We can conclude the following:

- average annual earnings for all workers increased slower than had been projected. Moreover, for the period from 2001 to 2003, the overall growth in average annual earnings was less than the increase in weekly wages in Québec;
- the average weekly wage in Canada increased more slowly than had been projected. That fact explains the overestimation of the MPE: in 2003, it was 39 900 $ instead of 40 000 $ as projected in the 2000 report;
- the breakdown of workers by level of earnings was different than had been projected. For several age groups, the proportion of workers earning less than the average wage increased. This means that over the last three years, the growth in earnings was greater for workers earning more than the average wage.

Table 64
Nominal rate of return

YEAR	2000 ACTUARIAL REPORT	OBSERVED DATA
2001	1,2%	- 4,8%
2002	6,7%	- 10,0%
2003	6,7%	16,0%
Average rate	4,0%	- 0,2%

2.3 Investment income

Net investment income was - 141 million $ for the years 2001 to 2003. This sum is comprised of income of 2,2 billion $ and a decline in the fair value of investments of 2,4 billion $ during this period. The projected net investment income was 2,3 billion $. The downward movement on the reserve resulting from differences in yields is therefore 2,4 billion $ compared to the projection in the 2000 report. Table 64 compares the nominal rates of return projected in the 2000 report to rates observed from 2001 to 2003.

During this period, the average rate of return for the variable-income securities portfolio was - 6,4%, while the projected yield for this portfolio was 2,9%. The rate incorporated the experience known at the time the 2000 report was completed, that is, a negative yield during the first six months of 2001. Furthermore, the average rate of return on the bonds portfolio was 8,6%, compared with a projected rate of 5,1%.

2.4 Administration costs

During the period from 2001 to 2003, administration of the Québec Pension Plan costs 25,0 million $ less than had been projected. The administration costs of the Plan comprise the costs incurred by the Régie des rentes du Québec for the Plan's administration and the fees charged by the Québec Ministère du Revenu for the collection of contributions. The observed difference of 9,4% is mainly the result of an overestimation of costs for the first year of the projection period.

2.5 Benefits

Aggregate benefit payments were 0,4% higher than the projected amounts, that is, a difference of 81,1 million $. The under-estimation of some benefits partially offsets the overestimation of others. These differences can be attributed to a number of circumstances, including two that affect all of the types of benefits, namely the overestimation of the number of deaths between 2001 and 2003 (mortality rates were lower than those projected) and differences in the rate pensions were indexed in 2003.

The indexation rate for benefits on 1 January of each year is based on the average inflation rate observed for the 12-month period ending in October of the preceding year. Estimates of the indexation rates in the 2000 report for 2001, 2002 and 2003 were, respectively 2,5%, 3,0% and 2,1%. Only the rate observed in 2003 (1,6%) was different than the projection.

Table 65 shows that for the death benefit and surviving spouse's pension, benefits were overestimated. On the other hand, they were underestimated for the disability pension, orphan's pension and pension for a disabled person's child and income security (welfare) reimbursements. Differences larger than 19 million $, that is, 0,1% of total benefits are examined in more detail in the following subsections.

2.5.1 Retirement pension

Sums actually paid in retirement pension benefits were 0,4% higher than the projected sums, that is, 53,9 million $. Most of the difference is the result of overestimating the number of deaths and underestimating the number of new women beneficiaries.

Table 65
Benefit payments in 2001, 2002 and 2003
(in millions of dollars)

	OPERATING RESULTS (A)	PROJECTION IN THE 2000 ACTUARIAL REPORT (B)	DIFFERENCE (C) = (A) – (B)	DEVIATION (C) / (B)
	$	$	$	%
Retirement pension	14 130,6	14 076,7	53,9	0,4
Disability pension	1 790,1	1 692,3	97,8	5,8
Death benefit	263,2	282,5	- 19,3	-6,8
Surviving spouse's pension	3 906,9	3 965,3	- 58,4	-1,5
Orphan's pension and pension for a disabled contributor's child	74,7	68,5	6,2	9,1
Refunds to social assistance	12,5	11,5	1,0	8,7
Total	20 177,9	20 096,8	81,1	0,4

Among all of the different types of benefits, the most significant difference between the amount of benefits paid out and projections is that pertaining to retirement pensions, which represent more than 70% of benefit payouts.

2.5.2 Disability pension

Sums actually paid in disability pension benefits were 5,8% greater than the projected sums, that is, a difference of 97,8 million $. This difference is mainly the result of underestimating the number of new beneficiaries. The underestimation is attributed largely to an unexpected addition of 2 300 beneficiaries from the Ministère de l'Emploi, de la Solidarité sociale et de la Famille to the beneficiary population as at 31 December 2003, as indicated in section 5.1 of Appendix III. The difference observed is also the result of an overestimation of the number of deaths among beneficiaries receiving a disability pension.

2.5.3 Death benefit

The sums actually paid in death benefits were 6,8% less than projected sums, that is, a difference of 19,3 million $. This difference is attributed to an overestimation of the number of deaths among contributors.

2.5.4 Surviving spouse's pension

Sums actually paid for surviving spouse's pension were 1,5% less than the projected sums, that is, 58,4 million $. The difference is mainly the result of overestimating the number of deaths among men and consequently, the number of new women beneficiaries, and to an overestimation of the amount of an average pension.

2.6 Reserve as at 31 December 2003

The 2000 report projected an increase of 3,4 billion $ in the reserve between 2000 and 2003. In fact, the reserve increased by 1,3 billion $, reaching 19,4 billion $ as at 31 December 2003. By adding together the differences explained above, we can see that cash inflows were 8,8% lower than projected sums, mainly because of lower investment income. Cash outflows were 0,3% higher than projected.

3. Comparison of the projection in the actuarial report as at 31 December 2000 with the actuarial report as at 31 December 2003

Table 66 shows that, according to the present report, the reserve expressed as a proportion of cash outflows for the following year is less than that projected in the preceding report, throughout the entire projection period.

Table 66
Reserve as a proportion of cash outflows for the following year

YEAR	2000 ACTUARIAL REPORT	2003 ACTUARIAL REPORT
2004	3,1	2,7
2005	3,2	2,8
2006	3,4	2,9
2007	3,5	3,0
2008	3,6	3,1
2009	3,7	3,2
2010	3,9	3,3
2015	4,3	3,7
2020	4,5	3,9
2025	4,4	3,7
2030	4,2	3,4
2035	4,0	3,1
2040	3,7	2,8
2045	3,4	2,2
2050	3,1	1,6

The differences in the results from one report to the next are mainly the result of taking into account the Plan's observed experience until 2003 and of revisions to the assumptions. The following section takes a closer look at the variations and their effects on the level of the reserve at the end of the projection period.

4. Reconciliation of the projection in the actuarial report as at 31 December 2000 with the actuarial report as at 31 December 2003

The results of this report were reconciled with those of the report as at 31 December 2000, so as to determine the effects of the numerous changes that affect the projections. The indicators used for the reconciliation are the reserve in 2050 expressed as a proportion of the cash outflows for the following year and the steady-state contribution rate, as defined in section 5.4.1 of the report.

Only assumptions having a significant effect on the results in the report were selected for the reconciliation, which was made in three steps:

- first, the effect of the improvements made in the projection model between 2001 and 2003 was evaluated;
- second, data from the Plan's experience for 2001, 2002 and 2003 were substituted for the assumptions used in the previous report, so as to measure the variations that they make in the results, compared with the projection in this report. For that purpose, the economic and benefits data for 2001 to 2003 were updated. Differences in demographic changes are not significant;
- third, the net effect of each of the main changes in the assumptions from one report to the next for the period from 2004 to 2050 was measured.

The changes to assumptions whose effect was measured in the third step of the reconciliation are as follows:

- the total fertility rate was adjusted downward compared to the previous

report. In the report of 2000, the rate rises from 1,50 to 1,65 between 2004 and 2015 and remains stable thereafter. In this report, the rate increases from 1,47 to 1,60 between 2004 and 2015 and remains stable thereafter;

- recent experience shows a significant reduction in mortality over the last few years. In this report, life expectancies at the beginning of the projection period are higher than those used in the 2000 report. This difference increases continuously over the long term. Therefore, the reduction in mortality projected in the actuarial report as at 31 December 2003 is greater than that projected for the period of 2004 to 2050 in the 2000 report;

- migration progresses differently in both reports. In the 2000 report, net migration increased from 10 500 in 2001 to 20 000 in 2015 and remained stable thereafter. In this report, net migration increases from 18 500 in 2004 to 23 000 in 2010 and remains stable thereafter;

- the economically active population is higher in this report than the 2000 report. In fact, the activity rate for people in the 20 to 64 age group anticipated for 2004 was 77,0% in the 2000 report. This rate increases significantly in this report to 80,1%. The anticipated variation from 2004 to 2050 is therefore reduced accordingly. The activity rate mentioned above increased 4,6 percentage points in the 2000 report, but in this report it increases only 3,6 percentage points;

- the number of jobs is higher in this report than in the 2000 report. In fact, a total of 3 567 000 jobs was anticipated for 2004 in the 2000 report. The number increases significantly in this report to 3 694 000. The annual variation in jobs is almost identical in the two reports with an average of 0,5% between 2004 and 2015 and -0,3% between 2015 and 2035;

- in the previous report, the inflation rate was 2,0% between 2004 and 2006, then increases and reaches its maximum of 2,7% in 2013. In this report, the inflation rate is 1,5% in 2004, then increases, reaching its maximum of 2,5% in 2014;

- for 2004 to 2009, the real rate of increase in average employment earnings is 1,1% in the report of 2000 and 0,8% in this report. This rate is set at 1,2% as of 2010 in both reports;

- maximum pensionable earnings (MPE) are lower in this report over the entire projection period, following a downward adjustment of 500 $ in 2004 and a reduction of the inflation assumption, since it affects the nominal growth of wages;

- in this report, the incidence rates of disability are higher for women but lower for men over age 55 than in the 2000 report;

- mortality rates for disabled persons are lower in this report than the 2000 report;

- in this report, eligibility rates for a retirement pension are higher than the previous report and the total population is slightly higher; it results in an increase in the number of new retirees, compared to the 2000 report, for each year in the projection period for women and as of 2010 for men;

- the number of new surviving spouse's pensions declines compared to the 2000 report, due primarily to a drop in mortality rates;

- in this report, the real rate of return varies, unlike the preceding report in which it was to remain fixed beginning in

2002. It is 4,4% in 2004, increases to 4,9% in 2009 and remains constant until 2015, then declines to its ultimate rate of 4,6% in 2025, that is, an average rate of 4,7% for the period of 2004 to 2050. The average rate was lower by 0,02 percentage point for the period of 2004 to 2050 in the 2000 report.

Table 67 shows the results of the reconciliation. The table reveals that the economic conditions which prevailed until 2003 have a major negative impact on the long-term level of the reserve.

As for the projection assumptions, according to this report, the level of the reserve in 2050 is reduced primarily by a variation in mortality rates, and increased by a variation in employment and net migration.

Table 67
Reconciliation of the results of the report as at 31 December 2003 with those of the previous report

	RESERVE IN 2050 AS A PROPORTION OF CASH OUTFLOWS OF THE FOLLOWING YEAR	STEADY-STATE CONTRIBUTION RATE
RESULTS OF THE ACTUARIAL REPORT AS AT 31 DECEMBER 2000	**3,1**	**10,10**

CHANGES	MAIN VARIATIONS WITH RESPECT TO THE 2000 REPORT		RESERVE IN 2050 AS A PROPORTION OF CASH OUTFLOWS OF THE FOLLOWING YEAR: EFFECT OF A CHANGE		STEADY-STATE CONTRIBUTION RATE: EFFECT OF A CHANGE	
1) Methodological improvements			+ 0,2	3,3	0,00	10,10
2) Effect of observed experience, 2001 to 2003						
Contributions	Up:	number of contributors	+ 0,1	3,4	- 0,01	10,09
Benefits	Up:	number of beneficiaries (disability and retirement pensions)	- 0,4	3,0	+ 0,04	10,13
Yield	Down:	real rate of return	- 1,2	1,8	+ 0,10	10,23
3) Projection assumptions						
Fertility rates	Down		- 0,2	1,6	+ 0,05	10,28
Mortality	Higher life expectancy in 2004, and more significant decline in mortality rates of the population in the future		- 1,2	0,4	+ 0,18	10,46
Migration	Increase in net migration		+ 1,0	1,4	- 0,10	10,36
Activity rates and job growth	Up		+ 0,7	2,1	- 0,12	10,24
Inflation rate	Down		- 0,3	1,8	+ 0,03	10,27
Wages	Smaller wage and MPE increases		- 0,1	1,7	+ 0,02	10,29
Disability	Decline in mortality rates of beneficiaries Increase in incidence rate for women		- 0,3	1,4	+ 0,03	10,32

		RESERVE IN 2050 AS A PROPORTION OF CASH OUTFLOWS OF THE FOLLOWING YEAR			STEADY-STATE CONTRIBUTION RATE
CHANGES	MAIN VARIATIONS WITH RESPECT TO THE 2000 REPORT	EFFECT OF A CHANGE		EFFECT OF A CHANGE	
3) Projection assumptions (continued)					
Retirement	Increase in number of beneficiaries	- 0,1	1,3	+ 0,01	10,33
Spouses	Decline in number of new beneficiaries	+ 0,2	1,5	- 0,02	10,31
Yield	Increase in average rate of return	+ 0,1	1,6	- 0,01	10,30
RESULTS OF THE ACTUARIAL REPORT AS AT 31 DECEMBER 2003			**1,6**		**10,30**