

**GOVERNMENT OF MAURITIUS  
NATIONAL SAVINGS FUND**

**ACTUARIAL REVIEW 30/6/2000**

**GOVERNMENT OF MAURITIUS**

**ACTUARIAL REVIEW**  
**OF**  
**MAURITIUS NATIONAL SAVINGS FUND**  
**AS AT 30 JUNE 2000**

**REPORT BY**  
**GOVERNMENT ACTUARY'S DEPARTMENT, LONDON**

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**MAURITIUS NATIONAL SAVINGS FUND**

**ACTUARIAL REVIEW OF THE MAURITIUS  
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TO: THE HONOURABLE SAMIOULLAH LAUTHAN,  
Minister of Social Security, National Solidarity and Senior Citizen Welfare and Reform  
Institutions,  
Government of Mauritius

Sir,

In accordance with the terms of Section 11 of the National Savings Fund Act 1995, I have carried out an actuarial review of the National Savings Fund as at 30 June 2000. A summary of my conclusions is given in the first section of the report and a fuller description of the review in later sections.

Andrew G Young  
Fellow of the Institute of Actuaries

## 1. SUMMARY and CONCLUSIONS

- 1.1 This review provides projections of the income and expenditure of the National Savings Fund (NSF) over the next 40 years. It also comments on relevant financial aspects of the operation of the Fund.
- 1.2 This first section summarises the results and conclusions of the review. The background to the review is described in Sections 2 and 3. The data and assumptions are described in Sections 4 and 5. The results are set out and discussed in Sections 6, 7 and 8.

### Calculation of the lump sums

- 1.3 It is important for the satisfactory operation of the NSF that the interest allocated to the individual accounts each year is equal to the investment return earned by the assets of the fund (including any capital gains or losses) less the amount of the administration charge. The calculations currently carried out to determine the interest to be allocated each year allow for these items.
- 1.4 If the interest allocated to the savings accounts exceeds this, then the liabilities of the fund will exceed the value of its assets. To correct such a position, the interest allocated in later years would have to be lower than the amount earned less the administration charge. Similarly, if the interest allocated in any year were lower than the investment income less the administration charge, the size of the NSF would exceed its liabilities to the individual savings account holders. In effect, current contributors would be paid less interest than their savings deserves. Either of these two misallocations could introduce unfairness between different generations of member. In order to ensure that the members are treated fairly in relation to the investment returns which their contributions have generated, the investment return should include unrealised as well as realised capital gains or losses as appropriate.
- 1.5 Any minor departure from this general requirement due to the rate of interest credited including some element of estimation or rounding of the rate of return allocated to the accounts should be offset as far as practicable by appropriate adjustments in subsequent years. This will ensure that the accumulated interest will be as fair as possible.
- 1.6 This requirement applies particularly when an individual receives a lump sum from the Fund. They should receive the amount of their accumulated entitlement based on their contributions and the allocated investment return during their membership. This is the case whether the payment is made when the individual reaches their normal age for retirement or at an earlier age as a result of some other contingency. It also applies if the legal provisions under which lump sum payments are made were amended, whether that resulted in earlier or later payment of lump sums.
- 1.7 One example of this has recently been the extension of the definition of "retirement" within the rules of the NSF to include voluntary retirement pursuant to section 23 of the Sugar Industry Efficiency Act 2001. Payments made for such specific reasons for "early retirements" must be of the amount following the above principles. At present, the average balance in individual accounts is relatively small and contribution income greatly exceeds expenditure. Any increase in the short term in the number of lump sum payments as a result of specific redundancy schemes is unlikely to affect the liquidity of the Fund.

### **Projections of the level of the NSF**

- 1.8 For the next 20 years or so, the contributions are expected to exceed expenditure on lump sums. The investment income earned by the Fund's assets, together with this positive cash flow, will be available for new investment. Thereafter, expenditure on the lump sums is estimated to increase to such an extent that it will eventually exceed contribution income. It will then be necessary for increasing amounts of the investment income to be used, together with the contributions received in the year, to finance the cash flow expenditure on lump sums.
- 1.9 The annual excess of contributions and investment income over total expenditure can be expected to continue to increase slowly in real terms until around 2015, reaching a level some 40% higher than at present on the main assumptions used for the projections. Thereafter, this annual surplus will slowly reduce as the average level and number of lump sum payments increase. It will however remain positive throughout the projection period as long as real economic growth remains positive.
- 1.10 The Fund will continue to increase but, as the NSF matures, will tend to stabilise as a multiple of contribution income, apart from some fluctuations from year to year depending on the precise number of people reaching age 60 and receiving lump sums in each year. On average, on the main assumptions, the fund is estimated to be eventually about 25 times the annual contribution income and 16 times the annual lump sum expenditure.
- 1.11 The ratio of lump sum payments to contribution income rises to a peak in the early 2040s, around the end of the period covered by the detailed projections, with the annual payments about 75% higher than the annual contribution income. In the longer term, on the main economic assumptions used, it settles down at around 50% higher. In the longer term, in terms of the annual cash flow, around 55% of investment income in each year is used, together with the contribution income, to meet the lump sum payments in the year.

### **Administration charge**

- 1.12 All the estimates in the report assume that the annual administration charges in future will continue, as at present, to be equal to 2.5% of the gross contributions. This administration charge is paid to the National Pension Fund (NPF), which carries out the administration for the NSF. It is not part of the actuarial review to assess whether this level of charge is reasonable in the light of the actual cost of administration carried out by the NPF for the NSF. It is however clearly efficient for the contribution collection to be done in conjunction of that for the NPF.
- 1.13 At present there are very few payments of lump sums. The amounts involved and the costs of administering them are relatively small. In future, the administration charge, based solely on the level of contribution income, will have to pay for both the collection of the contributions and the payment of a steadily increasing number of lump sums. This may make unsuitable a charge based solely on the contribution income. At the very least, it might be reasonable for those responsible for the administration to review from time to time the actual costs involved and the level of the charge. As stated above, provided the actual administration charge is correctly allowed for in the formula used for calculating the rate of return allocated to the individual accounts, the finances of the NSF will continue to remain sound.

- 1.14 It may be noted that if for some reason the scheme were to close down and no contributions were paid after some date in future, there would then be no administration charge levied using the current formula as there would be no contributions. However payments would continue for another 40 or so years.

### **Investment Strategy and Lump Sum Guarantee**

- 1.15 It is necessary for the investment strategy to take into account the guarantee attaching to the lump sum payments. The Act does not state precisely how the lump sums are to be calculated but Section 24 (2) (c) refers to regulations which may provide for payments of the lump sum. In the (Claims and Payments) Regulations 1997 it defines the "lump sum" as follows:

*"lump sum" means a lump sum, payable to an employee under Section 4(a) of the Act [which states the objects of the Fund], which shall be made up of contributions paid by an employer under Sections 5 and 9(1)(b) of the Act [these cover contributions deduction and payments under an earlier Act] in respect of that employee, together with accrued interest as determined by an actuary.*

- 1.16 This implies that a beneficiary cannot receive a lump sum of less than the amount of the contributions which have been paid into his or her account. Because of this guarantee, the accumulated interest to be added cannot be negative. If the investments taken as a whole were subject to significant capital value risk, it could be possible for the amount of the investment income to be less than the 2.5% of contributions charged for administration which is deducted from the investment income in calculating the interest rate to be allocated. As a result, it is essential for the proportion of the fund invested in assets with a capital value risk to be restricted to a level such that the possible loss in capital value would not result in the calculated interest rate to be added to the individual accounts becoming negative.
- 1.17 At the date of this report, the investments were mainly in Treasury Bills and other holdings in government and similar stocks. The capital value risk is currently minimal and should not endanger the guarantee. Whilst maintaining such investments as priorities, it might be possible to secure a higher overall return on the Fund's assets by extending the range of possible investments for part of the fund. However, any proposal to increase significantly the proportion of the NSF which is invested in assets whose capital value is exposed to potential falls, such as property or shares in the stock exchange, would need to be examined carefully and take the lump sum guarantee fully into account.

## 2. INTRODUCTION

- 2.1 This is the first actuarial review in accordance with Section 11 of the National Savings Act 1995 (“the Act”), which requires an actuarial valuation at 5 yearly intervals to be made by an actuary appointed by the Minister.
- 2.2 The Mauritius National Savings Fund was introduced in July 1994 by means of the Act. According to the 1995 Act, the commencement date was July 1995. However contributions were paid and credited to the NSF and the individual accounts in respect of 1994/95. From the accounting information, no payments of lump sums were made before 1997/98.
- 2.3 A number of minor amendments have been to the rules of the Fund since its introduction. In particular, these changes have widened the definition of “retirement” enabling people under certain extra circumstances to be eligible for their lump sum payment before their normal age retirement. Although this will have some effect on the cash flow of the fund in future, none of the amendments has changed the main benefit or contribution provisions or the operation of the NSF in ways which will materially affect the financial prospects for the Fund.
- 2.4 The NSF now provides payment of lump sums on the following conditions:
- (i) “age-retirement” on reaching age 60. In practice a small number of people receive their lump sum entitlements after age 60, but the financial effect is negligible.
  - (ii) “early retirement”. The Act provides for payments on retirement before age 60 on several grounds. These include early retirement on medical grounds or in respect of specific types of employment. For example, people in the Police Force are eligible for their lump sum after 25 years of pensionable service. The financial projections allow for such retirement before the normal retirement age based on the data provided for the review.
  - (iii) on the death of a contributor. Payments in respect of deaths are made to the surviving spouse, children (if no spouse) or legal representative (if no spouse or children)
  - (iv) The Act also makes provision for other schemes of payments including loan schemes to be operated “as may be prescribed”. The data provided for the review did not contain any such cases. It is recommended that any such payments must be made on appropriate commercial terms, in order that equity is maintained between those members who receive such loans and those who do not. Similarly, as long as any such loans are treated in an equitable and correct way in the calculation of the individual’s entitlement for the Fund, the financial position of the Fund as a whole should be unaffected.

Further details of the Scheme are contained in Appendix A.

- 2.5 The lump sums payments are equal to the amount of the individual's account balance at the time of payment. The balance in an individual's account is equal to the contributions paid together with the interest added between the dates when the contributions were made and the date of receiving the lump sum. Thus, provided the interest allocated is calculated correctly, and the total amount allocated in respect of a particular year is equal to the total investment return less the administration cost, the Fund should operate satisfactorily. The total amount of the Fund's assets at any one time should be the sum of the contributions paid by all the current members together with the investment income generated from the contributions of these members, including any unrealised and realised capital gains, and this should be identical to the liabilities. At present, the level of unrealised capital gains is relatively small, but in future might become more significant. In order to ensure that all members are rewarded fully for the investment return generated by their contributions, it is important that capital gains or losses, whether realised or not, are included in the calculation of the allocated investment return.
- 2.6 Contributions equal to 2.5 per cent of salary are paid by employers in respect of all employees in the public and private sector. There is a lower earnings limit (LEL) and upper earnings limit (UEL) for contributions, both of which have increased over the 5 years since 1995/96. The LEL has increased from Rs 612 a month and the UEL from Rs 4625 a month in 1995/96 and 1996/97. In 1997/98 and 1998/99 the LEL and UEL were Rs 699 and Rs 5100 a month respectively. From 1999/00 the LEL was increased to Rs 800 a month and the UEL to Rs 5535 a month.

### **Objectives of the review**

- 2.7 The main purposes of the review are to ensure that the way in which the fund operates is financially sound from an actuarial point of view and to examine the likely future trends in the income and outgo of the NSF and in the balance of the Fund assets.
- 2.8 As the NSF only started some 7 years ago, it will be many years before lump sums are awarded after a full working life of contributions. In addition, the number of people reaching age 60 will rise substantially in future. For both of these reasons, the expenditure from the NSF will increase rapidly. On the other hand, contribution income will remain relatively stable by comparison if salary inflation is ignored, as the number of contributors is not expected to increase as fast as the number of people reaching age 60. As a result of the changes in the numbers at working ages in future in the light of the population projection assumptions, the number of contributors increases for a time and then starts to fall.
- 2.9 Thus, apart from the inevitable increase in the average level of lump sums as the NSF itself matures, the main factors affecting the annual finances of the NSF in future are:
- (i) changes in the relative numbers of contributors and of people reaching 60 in each future year;
  - (ii) future rates of increase in earnings and interest rates.

The assumptions made concerning these and other factors are discussed later in the report.

### 3. The FINANCES OF THE FUND 1995-2000

- 3.1 The finances of the NSF mainly depend on:
- (a) the contribution income, which in turn depends on the numbers employed and the level of earnings;
  - (b) the amounts paid out as lump sums, based on the annual contributions up to the time the lump sums are paid and the interest income allocated to the individual accounts;
  - (c) the investment income earned by the assets of the NSF.
- 3.2 The accounts of the NSF showing these amounts as well as the smaller financial items for the financial years to 30 June 2000 are summarised in Appendix B.
- 3.3 Total expenditure on lump sums in 1999/00 was some 120% higher than in 1997/98. This rapid increase over the short period is inevitable at present as the lump sums become based on more years of contribution. For the three years up to June 2000, the accounts for the NSF show that the amounts paid out as lump sums were Rs9.6 million in 1997/98, Rs33.4 million in 1998/99 and Rs21.2 million in 1999/00. The figures for 1998/99 contain a backlog of cases and the 1999/00 amounts do not match the detailed data provided in respect of lump sum payments due in respect of that year, which suggest a figure of some Rs 28m before adjustments for late notifications and about Rs33 million after allowing for such extra amounts. It is inevitable that there will be timing differences between the paying of lump sums and the corresponding accounting information and the statistical data which is based on the dates on which payments were due.
- 3.4 Contribution income increased by about 29% between 1995/96 and 1999/00. Of this increase, about 18% is due to the rise in the average amount of contributions as a result of increases in average earnings and of the earnings limits determining contribution liability. The remainder (about 9%) has resulted from the rise in the number of employees for whom contributions are paid to the Fund.
- 3.5 In each of the 5 years 1995/96 to 1999/00, there was a substantial excess of income over expenditure. As a result, the Fund balance increased by about 860%, from Rs247 million in July 1995 to Rs2385 million as at June 2000. This includes the effect of an adjustment to the balance at June 1999. The large increase in the Fund balance over the period was due to the excess of contributions over the expenditure on lump sums and the costs of administration, which is inevitable in the early years of the NSF. In addition, the continued increase in the balance of the Fund and high investment returns earned on the NSF's assets have already produced substantial amounts of investment income.

## **4. DATA**

- 4.1 The estimates for the review were based on a large amount of demographic, economic, statistical and membership data.
- 4.2 The Central Statistical Office provided us with the latest population projections, both with and without assumed levels of future migration. The results were in 5-year age groups and at 5-year intervals from 1999 to 2039. A projection for each year by single age with allowance for migration was also provided and this formed the basis of the estimates for the period 1999 to 2039. Other demographic data were available from regular publications produced by CSO.
- 4.3 We extended the projections beyond 2039 using approximate methods, as it was clear from the results up to that year that there were significant demographic features between 2040 and 2060 in the numbers reaching 60.
- 4.4 The Ministry of Social Security provided data on the number of contributors and the amounts of contributions paid in respect of contributory members of the Fund for each of the last 5 years, analysed according to age, sex and year of contribution. Data were also provided on the total of the individual accounts accumulated up to June 2000 by contributory members, analysed according to age and sex. There was some uncertainty about the completeness of the most recent data, since there is inevitably a time lag between contributions paid recently and their being fully allocated to the individual members' accounts. Estimates were made to allow for the deficient data on contributions for 1999/00. One set of data on payments in respect of 1999/00, split between deaths, early retirements and age retirements was also provided. This also included from some deficiencies for similar reasons as the contributions data for that year.
- 4.5 In general, the above data were used to estimate the parameters needed for the projections. Adjustments, based on comparisons with the accounting information or other data, were made as necessary to the factors derived directly from the data to allow for any deficiencies in the data.
- 4.6 A summary of the main data on membership of the NSF is included in Appendix C.

## 5. DEMOGRAPHIC and OTHER ASSUMPTIONS

- 5.1 The estimates for the future levels of contribution income and the lump sum payments are based on the projected future population in the Republic of Mauritius. Paragraphs 5.2 to 5.6 describe and consider the population projections used for the review. Paragraphs 5.7 to 5.13 describe the methods used to estimate the number of contributors and amounts of contribution income. Paragraphs 5.14 to 5.17 outline the general nature of the assumptions made in estimating the benefit expenditure. Paragraphs 5.18 to 5.21 explain the estimates for the administrative costs.

### Future population

- 5.2 The population projections used were prepared by the Mauritius CSO. The detailed results of the projection are shown in Appendix D. **Table 1** summarises the main features of the projections relevant for the review, together with the key “beneficiary support ratio” in specific future years covered by the review. For the NSF, the key ratio is the number in the population at working ages divided by the number reaching age 60. For this purpose, the working ages are taken to be 18-59.

**TABLE 1**  
**POPULATION PROJECTION, 2000 – 2039**

Year	Population at Working Ages (18-59)	Population Aged 60	Ratio of: Working ages/ Age 60
2000	717.7	7.5	95.3
2005	757.8	9.7	78.1
2010	795.3	12.9	61.8
2015	815.4	14.2	57.6
2020	820.3	17.2	47.6
2025	816.8	18.7	43.6
2030	813.6	17.4	46.8
2035	813.9	18.6	43.8
2039	805.0	19.6	41.1

- 5.3 The projection provided by the CSO ended in 2039, the final year shown in **Table 1**. We have extended the projection to later years using approximate methods. This showed that there are some “peaks” and “troughs” in the numbers reaching 60 in later years, especially soon after 2040. However even with such fluctuations, the ratio of the number at working ages to the number reaching age 60 only dips a shade below 40 at the “worst” point (when the number reaching age 60 is particularly high) and then settles at around 43 in the long term. Such a figure is to be expected in the longer term once the age distribution of the population of Mauritius stabilises as the ratio is the number of people at all working ages to the number in the single age 60 cohort in the year concerned.

- 5.4 The main features of the projections summarised in **Table 1** which will influence the future finances of the NSF are as follows:
- (a) The main expenditure is on age grounds, when people reach age 60. The numbers reaching age 60 and becoming eligible for the lump sum on age grounds are expected to more than double over the next 20 years and then to increase by a further 14% over the following 20 years. There will also be increases over the next 35 years or so in the level of savings in each individual account by the time the individual reaches age 60. As a result, there will be large increases in the estimated future expenditure.
  - (b) The number of people at working ages is expected to increase by about 14% between 2000 and 2020 and then fall slightly (by about 2%) over the subsequent 20 years. The trend in the number of employees in respect of whom contributions were paid over the review period is likely to be closely related to the changes in the numbers at working ages unless there are dramatic changes in labour force participation rates or the level of unemployment. This implies that there will be steadily increasing contributions for the first 20 years followed by relatively constant income thereafter if the income is considered in constant earnings terms.
  - (c) The projections show that the number of children is estimated to decrease steadily. The number of children in 2000 reflects the numbers of births in the past 15 years, and the reduction in future numbers reflects the assumed continuing lower level of fertility rates. Although the eventual level of fertility will be important in determining the finances of the NSF in the very long term, the assumptions about future fertility will have little impact over the next 40 years. Only people who are at least age 20 in 2000 will reach age 60 during the 40 year projection period. Similarly, future births will have no effect for the first 15 years on the projections of contributions. Subsequently, from 2015, any fertility effect will build up very slowly as births after 2000 enter the working population and pay contributions.
- 5.5 Projecting the future population of any country is subject to uncertainty. The assumptions used for this review are considered to be reasonable in the light of past trends. But it is important to bear in mind the underlying uncertainties when assessing the projection for future contributions and lump sum expenditure.
- 5.6 However, we would not expect any reasonable variations from the assumptions used for the projection to have a material effect on the projections and especially on the conclusions which can be drawn from them. As mentioned in paragraph 5.4(c), changes to fertility have little effect during the 39 years of the projection. Changes to the mortality assumptions could have a significant effect on the total number of pensioners and therefore on the finances of the National Pension Fund. However as most people who start contributing to the NSF are expected to reach age 60 on the basis of the current mortality assumptions, the scope for any reasonable changes to the mortality assumptions to affect the numbers who reach age 60 is much less. Moreover, as lump sum payments equal to the accumulated individual funds are paid on death, changing the mortality rates will simply affect the timing of a relatively small number of payments rather than affect the fundamental balance between income and expenditure. Thus the potential for any changes in mortality rates to materially affect the financial projections for the NSF is relatively limited.

## **Contributors and contributions**

- 5.7 The first stage in estimating the amount of contributions in future years was to calculate the total numbers in respect of whom contributions were paid by applying age and sex specific factors for the “proportions contributing to the NSF” to the projected population at working ages. “Proportions contributing to the NSF” rates were estimated from the data of contributors provided by the Ministry of Social Security for the 1995-2000 period. The 1999/00 data were known to be deficient due to the inevitable time taken for information on contributors to be received and recorded. In addition, the 1998/99 data appeared somewhat low in comparison with the earlier years. The factors for the proportions contributing to the NSF were therefore based on the average for 1994/95 to 1997/98.
- 5.8 Contributions are based on the level of earnings and are collected on a “pay-as-you-earn” basis. The contribution rate to the NSF is 2.5 per cent of relevant earnings. This rate was in force during the past five years and has been assumed to continue for all future years. There are upper and lower limits to the earnings on which contribution liability is based. Contributions are not payable in respect of those employees with earnings below the earnings floor, which was Rs800 a month in 1999/00. Those with higher earnings have contributions paid in respect of all their earnings up to the earnings ceiling of Rs5535 a month from July 1999 (and Rs 6000 from July 2000).
- 5.9 These earnings limits are the same as for contributions to the National Pension Fund (NPF) and, given the way the NSF operates, it is reasonable to assume that this link will be maintained in future. In recent years, the floor and ceiling have been raised from time to time, usually every two years. On average over the past 10 years the increase has broadly reflected price inflation. However, if the floor were increased over time by less than the changes in earnings, then very low wage earners would become liable to pay small amounts of contribution. Similarly, if the ceiling fell relative to earnings then those with higher earnings would pay contributions on a steadily decreasing proportion of their earnings. If such changes are to occur they should be as a result of deliberate policy decisions by the Government rather than as an accidental effect of inflation.
- 5.10 It has therefore been assumed that, in the long term, the earnings floor and ceiling for contributions purposes will effectively be increased in line with general increases in earnings. This implies that the proportion of employees for whom contributions are paid to the Fund should not change significantly over time.
- 5.11 The estimates for total contribution income also depend on the average amounts of contributions per contributor. The factors used for the estimates were derived from the contribution data, adjusted on a sex and age basis to the 1999/00 level. Adjustments were made to the average derived directly from the detailed data to make the total consistent with the total for the 1999/00 contribution income by including an allowance for not posted and unknown contributions which were not included in the detailed data provided to us.
- 5.12 In order to obtain the projected numbers of contributors and contributions, the age specific factors were assumed to remain constant in future years. It has, therefore, effectively been assumed that, over the period covered by the review, the proportion of people of working ages who are contributors will remain constant for each sex and

age group, and that the earnings of each group of contributors will increase in line with general increases in earnings.

- 5.13 On the basis of the assumptions described in the preceding paragraphs, the estimated future numbers of contributors are shown in **Table 2**. This shows a steady rise over the next 20 years to a total about 16% higher than at present, followed by a slight decline of around 2% thereafter.

**TABLE 2**  
**Projected numbers of contributors, 2000 to 2039**

Year ending 30 June	Men	Women	Thousands
			Total
2000	216.8	119.5	336.3
2005	233.4	126.1	359.5
2010	245.3	130.5	375.7
2015	251.9	134.1	386.0
2020	254.4	135.3	389.7
2025	253.5	135.0	388.4
2030	252.2	134.3	386.6
2035	252.2	134.0	386.3
2039	250.0	132.7	382.7

Note : Figures for Men and Women may not sum to Total due to rounding.

### **Lump Sum payments**

- 5.14 The amount of the lump sum payable is always equal to the total of the contributions paid and the interest allocated to the individual's account.

### **Retirement lump sums**

- 5.15 Although there are several circumstances whereby people can receive their lump sums before the "normal" retirement age, lump sums are mostly payable from age 60. The detailed data included some payments of lump sums after age 60 and some allowance for such delays has been included in the projections by allowing for some payments at age 61. Estimates of future expenditure allow for the total amounts of contributions that each age group reaching age 60 could have paid and the investment return allocated each year. The total amounts of accumulated contributions which had been paid by each group up to the point of receiving their lump sums are consistent with the estimates for the future contribution income to the Fund.

### **Survivors' lump sums**

- 5.16 Contributory survivor's lump sums are payable on the death of a contributor, the amount payable being equal to the balance of the account at death. The estimates allow for lump sum payments on the death of contributors up to age 60.

### **Early retirement lump sums**

- 5.17 The rules include several provisions for "early retirements" and these are also allowed for in the estimates based on the numbers included in the data. The projected amounts of the different types of lump sum payments are based on the detailed factors set out in the tables in appendix E.

### **Costs of administration**

- 5.18 Currently, the NSF pays the NPF a sum equal to 2.5 per cent of the annual contribution income for the services of the NPF in administering the collection of contributions and the payment of lump sums. The projections are based on the assumption that this percentage will remain unchanged in future.
- 5.19 The current transfer to cover administration is solely dependent on the number of contributors and the average contributions. As the main administrative burden is currently the collection and recording of contributions, this simple method of assessing the transfer is reasonable at present. The number of lump sum payments is trivial at present but will increase substantially in future. This could imply that the actual costs of carrying out the administration will increase rather faster than the changes in the level of contributions and therefore in the 2.5% charge. This would be particularly so if the number of ways in which lump sums can be paid are increased and especially if the conditions governing eligibility for payment become more difficult to determine and administer and differ from those determining eligibility for pensions from the NPF.

- 5.20 For 1999/00 there were around 5,300 actual payments, of which about 4,000 were age retirements. The population projection shows around 7,500 people reaching age 60 in that year – it is not surprising that the number of lump sum awards is lower than the population given the proportion of the population likely to have been contributing at some time in the 5 or 6 years immediately before reaching age 60. By 2039 the numbers reaching 60 will be around 20,000 and by then probably nearly all will have some entitlement. There may be around 25,000 claims a year, some 5 to 6 times the present level. In view of this large change, the actual costs of administering the NSF might be reviewed from time to time to ensure that the charge remains reasonable.

## 6. MAIN FINANCIAL PROJECTION

- 6.1 As well as being dependent on the demographic changes in future, the projected amounts in real terms of income and expenditure in future years will depend on the future level of earnings and of interest rates and investment returns. If future inflation were assumed to be similar to current levels, then contribution income and lump sum payments expressed in cash terms would increase rapidly over the 40 years covered by this report. The results would only be meaningful if compared against corresponding estimates for gross national product, total earnings, etc., in future years. Even then it would be difficult to compare them with the corresponding amounts at the present time. The projections are, therefore, expressed in equivalent present day terms.
- 6.2 All the figures are shown in 1999-00 price terms so that they can be directly compared with the most recent accounts. The amounts in the main projection assume average earnings growth of 2% a year in excess of price increases, broadly in line with the changes over the past 10 years.
- 6.3 Over the period 1994-2000, the average investment return was about 9.5% a year or 9.8% if the capital gains are included. The average rate of increase in the average contribution was about 6% a year. However, the experience during this relatively short period cannot be taken as a reliable guide to the long-term future. For the main projections, therefore, it has been assumed that, over the long term, investment returns will exceed increases in average earnings by 2.0 per cent, which is reasonable in the light of historical and international longer term rates of investment return and the likely rates which can be earned in the longer term in future. The effect of alternative assumptions is shown in Section 8 of the report.
- 6.4 **Table 3** sets out the projected income and expenditure of the NSF for the period 1999-00 to 2038-39, the last year of the detailed population projection. Income and expenditure for 1999-2000 are also shown for comparison with future years. Further details are included in Appendix E. There is, inevitably, a degree of uncertainty about the projections of both contributions and lump sum payments and there is even greater uncertainty over the difference between these two figures and therefore the precise trend in future in the annual cash flow surplus and the growth in the level of the NS Fund. The projections become increasingly uncertain the further one moves into the future. Estimates for years more than 20 years hence should therefore be regarded as indicators of the various amounts rather than precise estimates.
- 6.5 The projected rising trend in contribution income and expenditure is the direct result of the assumed increase in real earnings together with increases in contributors and beneficiaries and the increasing amounts in savings accounts when people become eligible for their lump sum payments.
- 6.6 The estimates in **Table 3** indicate that contribution income is expected to increase by about 70% over the next 20 years and to rise by a further 43% over the following 20 years. This reflects the rise in the numbers at working ages over the next 20 years, followed by a levelling off thereafter as the effects of the reduction in the birth rate feed through to the numbers at working ages, combined with the real increase in earnings

compared with prices which gives rise to the continued increase in contribution income.

**TABLE 3**  
**PROJECTED INCOME AND EXPENDITURE OF THE NSF**

Rs millions in 1999/00 terms

	1999-00	2000-01	2004-05	2009-10	2014-15	2019-20	2024-25	2029-30	2034-35	2038-39
Fund at the start of year	1829	2385	4285	7102	10108	13189	16033	18660	21340	22907
<b>Income</b>										
Contributions from employers	375	389	450	521	592	662	728	802	886	950
Investment income	209	105	184	299	421	545	658	764	870	932
Other income	3									
Total Income	588	494	633	819	1013	1207	1386	1566	1757	1881
<b>Expenditure</b>										
Lump sum payments	21	47	93	227	371	594	860	1036	1327	1548
Administration	9	10	11	13	15	17	18	20	22	24
Other outgo	2									
Total Expenditure	33	57	105	240	386	611	878	1057	1349	1572
Excess of income over expenditure	555	437	529	580	626	596	508	510	407	310
Excess of contributions over payments	354	341	356	294	220	68	-131	-234	-441	-598
Fund balance at end of year (A)	2385	2821	4814	7681	10734	13785	16541	19170	21747	23217
<b>Key ratios</b>										
Contributions as % of end of year (EOY) balance	15.7	13.8	9.3	6.8	5.5	4.8	4.4	4.2	4.1	4.1
Payments as % of EOY balance	0.9	1.7	1.9	3.0	3.5	4.3	5.2	5.4	6.1	6.7

6.7 As can be seen from **Table 3**, the lump sums are projected to rise very rapidly over the period of the projection as the numbers reaching age 60 increase and the average amount of lump sum rises due to the longer period during which contributions have been paid and accumulated interest has been earned by the Fund.

- 6.8 The projected excess of contribution income over lump sum payments during the next 20 years will enable a large fund of assets to be built up. By June 2000 the NSF amounted to some Rs 2.4 billion, about six times the annual level of contribution income. The figures in **Table 3** show the projected balance of the Fund on the assumption that investment yields, on average, exceed earnings increases by 2 per cent a year. The Fund is projected to increase steadily over the next 20 years during which contributions exceed lump sum payments, reaching a level of about 20 times the annual contribution income.
- 6.9 The current large excess of contributions over expenditure is expected to decline slowly over the next 20 years and contributions and expenditure are estimated to be broadly equal by around 2021. Thereafter, lump sum benefit expenditure is expected to exceed contribution income and the excess expenditure will be met from the investment income.
- 6.10 **Table 3** also shows the contributions and payments as a percentage of the size of the fund at the end of the year (EOY). This shows that payments in any one year are always a relatively low proportion of the total amount in the NS Fund balance, even when the scheme is more mature and payments have increased greatly from the current level.
- 6.11 Expenditure on lump sums is, at present, very small because contributions have only been accruing since 1994. Lump sums paid to date have therefore been based on only a few years of contribution. Consequently, contribution income is currently much greater than expenditure on lump sums and substantial amounts of net income are available for new investment. The final row (labelled (A)) of financial figures in **Table 3** shows the projected size of the balance of the NSF in future. It is important to remember that this is shown in constant 1999-00 price terms. In estimating the future balance of the Fund, as stated in paragraphs 6.2 and 6.3 above, it has been assumed that the investments held will, on average, yield a rate of return on average 2 per cent a year in excess of the increase in earnings and earnings will increase on average 2 per cent more than prices. By 2039 the Fund, in real terms, is projected to be some ten times the level of June 2000.
- 6.12 Some approximate longer-term projections have been carried out to estimate the position after the end of the period for which the detailed population projections were available. These show that, when the numbers reaching age sixty peak around 2040, the net cash flow surplus in the year dips sharply. It then increases, with another dip around 2052 after which it increases steadily. In the longer term the size of the fund at the end of each year settles down at about 25 times the contribution income in the year. Similarly, this is about 16 times the typical expenditure in a single year. The NSF will thus be readily able to deal with fluctuations in the levels of lump sum payments from year to year due to changes in the numbers at each single age. Even in the expected peak year in future for the payment of lump sums, the fund is still some 14 times the level of expenditure.

## 7. INVESTMENTS and INVESTMENT RETURN

- 7.1 The investment policy of the National Savings Fund is governed by the objectives which are set out in Section 10 of the National Savings Act as follows:

*Any surplus remaining in the Fund may be held on deposit with the Government, loaned or invested in such manner as the Minister of Finance may determine, having regard to:*

- (a) *the need for an appropriate level of liquidity in the Fund*
- (b) *the need to secure the future value of the Fund*
- (c) *any advice received from the Committee*

The NPF and NSF Investment Committee is currently responsible for the investment of the Fund.

- 7.2 The main estimates in **Table 3** show that for the next 20 years the income from contributions is expected to exceed the cost of lump sums. Even without taking any account of investment income, the normal operation of the cash flow will generate adequate liquidity for the NSF. After 20 years, paying the lump sums will increasingly rely upon the income from the investments, and the liquidity will therefore depend increasingly upon the timing of the investment income receipts or on the sale of assets. As can be seen from **Table 3**, the total annual income from investments and contributions is expected to continue to exceed the lump sum payments by relatively large amounts. So, taking any year as a whole, there should not be any problems as far as liquidity is concerned. As long as the investment income receipts are reasonably regular throughout the year, the cash flow should be satisfactory.

- 7.3 It should therefore be possible to pay particular attention to the pursuance of objective (b), that is, to secure the future value of the Fund. This should lead to an investment policy whose primary aim would be to maximise the return on the investments subject, of course, to ensuring satisfactory security of the assets and the management of the Fund. This in turn should maximise the lump sums to be paid in future to members of the NSF.

- 7.4 However, it is also necessary for the investment strategy to take into account the guarantee attaching to the lump sum payments.

- 7.5 The Act does not state precisely how the lump sums are to be calculated but Section 24 (2) (c) refers to regulations which may provide for payments of the lump sum. In the (Claims and Payments) Regulations 1997 it defines the "lump sum" as follows:

*"lump sum" means a lump sum, payable to an employee under Section 4(a) of the Act [which states the objects of the Fund], which shall be made up of contributions paid by an employer under Sections 5 and 9(1)(b) of the Act [these cover contributions deduction and payments under an earlier Act] in respect of that employee, together with accrued interest as determined by an actuary.*

- 7.6 This implies that a beneficiary cannot receive a lump sum of less than the amount of the contributions which have been paid into his or her account. Whenever a lump sum is paid, the accumulated interest as determined by an actuary is added to the

total contributions. As stated in paragraph 2.5, this interest to be allocated should in aggregate be equal to the amount of the investment income less the administration charge earned on the contributions paid.

- 7.7 Because of this guarantee, the accumulated interest to be added cannot be negative. If the investments taken as a whole were subject to the risk of significant falls in their capital value, it could be possible for the amount of the investment income to be less than the 2.5% of contributions charged for administration and which is deducted from the investment income in calculating the interest rate to be allocated. As a result, it is essential for the proportion of the fund invested in assets with a capital value risk to be restricted to a level such that the possible loss in capital value would not result in the calculated interest rate to be added to the accounts becoming negative.
- 7.7 At the due date of this report, the investments of the NSF were mainly in Treasury Bills (42% of the total), with other significant holdings in government stocks, which are generally Development Loan stocks (16.5% of the total), and Debenture stocks and Shares (16%). Smaller amounts were in Government Bonds (10%), other Loans (7%) and on deposit (7%). As at 30 September 2000, just under 1% of the fund was invested in shares on the stock exchange. The capital value risk is currently minimal and should not endanger the guarantee. Whilst maintaining such investments as priorities, it might be possible to secure a higher overall return on the Fund's assets by extending the range of possible investments for part of the Fund. However, any proposal to increase significantly the proportion of the NSF which is invested in assets whose capital value is exposed to potential falls, such as property or shares in the stock exchange, would need to be examined carefully and take the guarantees fully into account.

## 8. EFFECT OF ALTERNATIVE ASSUMPTIONS

- 8.1 The financial estimates in Section 6 are based on assuming that average earnings increases will exceed price increases by 2% a year and that the rate of investment return will exceed average earnings increases by 2%. This section provides some estimates for the effects on the projections of making different assumptions for these two economic variables.

### Different assumptions for the rate of investment return

- 8.2 In order to indicate the sensitivity of the progress of the Fund to the rate of investment return in future, **Table 4** shows the projected balance of the Fund on five different assumptions for the rate of investment return in excess of earnings. For this table, the average real earnings increase is the same for all the different investment assumptions at 2% a year in excess of price increases, the same as was used for the main estimates in **Table 3**.

**TABLE 4**  
**PROJECTED BALANCE of the NSF**  
**Based on different rates of INVESTMENT RETURN**

Rs millions in 1999/00 terms

Year	Rate of investment return : Earnings increase plus				
	0%	1%	1.5%	2% (main)	3%
1999-00	2385	2385	2385	2385	2385
2000-01	2768	2795	2808	2821	2848
2004-05	4452	4629	4721	4814	5008
2009-10	6711	7176	7423	7681	8232
2014-15	8952	9790	10248	10734	11801
2019-20	11070	12326	13028	13785	15486
2024-25	12908	14565	15509	16541	18907
2029-30	14678	16707	17878	19170	22180
2034-35	16493	18853	20225	21747	25324
2038-39	17592	20117	21586	23217	27056
Year when payments exceed contributions	2035	2025	2024	2022	2020

- 8.3 **Table 4** shows that the size of the Fund will be very sensitive to relatively small variations in the actual rate of return earned on the investments, especially in the longer term. This reflects the compounding effect of even small differences in interest rates.

8.4 The final row of **Table 4** shows that the higher the rate of investment return actually achieved in future, the earlier is the year when the annual level of lump sum payments exceeds contribution income. This is as would be expected. The lump sum payments will be higher as a result of the higher rate of interest allocated to them due to the higher investment return achieved, whilst the contribution income is unaffected by the level of the investment returns. Of course, as well as there being higher payments, the total income from both contributions and the investment income will be higher as a result of the greater level of the actual investment return.

**Different assumptions for real earnings growth**

8.5 **Table 5** shows the projected level of the Fund assuming that average earnings increase by 3% a year greater than price increases (as compared with 2% in the main assumptions). The table includes projections for different levels of the real rate of return on investment income of 0%, 1%, 2% and 3% more than average earnings increases.

**TABLE 5**  
**PROJECTED LEVEL OF THE NSF with**  
**DIFFERENT REAL EARNINGS ASSUMPTION**  
*Earnings increase 3% a year higher than prices*  
 Rs millions in 1999/00 terms

Year	Rate of return relative to earnings			
	0% more	1% more	2% more	3% more
1999-00	2385	2385	2385	2385
2000-01	2798	2825	2852	2880
2004-05	4690	4878	5075	5282
2009-10	7435	7955	8521	9139
2014-15	10425	11410	12523	13781
2019-20	13546	15099	16907	19019
2024-25	16593	18748	21322	24410
2029-30	19820	22592	25964	30094
2034-35	23388	26776	30939	36094
2038-39	25941	29708	34344	40098
Year when payments exceed contributions	2035	2025	2022	2020

- 8.7 The figures in **Table 5** may be compared with those in **Table 4** to show the effect of changing the assumed rate of real earnings growth. The higher assumption for the future real earnings growth in **Table 5** produces significantly larger projected levels for the fund balance.
- 8.8 Similarly, **Table 6** shows equivalent projections with average earnings increasing at 1% a year in excess of price increases instead of the 3% in **Table 5** and the 2% for the main assumption.

**TABLE 6**  
**PROJECTED LEVEL OF THE NSF with**  
**DIFFERENT REAL EARNINGS ASSUMPTION**

*Earnings increase 1% higher than to prices*  
Rs millions in 1999/00 terms

Year	Rate of return relative to earnings			
	0% more	1% more	2% more	3% more
1999-00	2385	2385	2385	2385
2000-01	2739	2765	2791	2817
2004-05	4226	4392	4566	4749
2009-10	6056	6471	6922	7414
2014-15	7683	8394	9196	10099
2019-20	9038	10052	11230	12600
2024-25	10027	11301	12817	14628
2029-30	10851	12335	14132	16323
2034-35	11605	13247	15256	17733
2038-39	11899	13587	15657	18213
Year when payments exceed contributions	2035	2025	2023	2020

- 8.9 In considering the different results based on the different economic assumptions, it is important to emphasize the fundamental point made in earlier sections. For all the assumptions in **Tables 3,4,5** and **6**, the level of the Fund is equal to the accumulated amounts in the individual accounts of all the people who have contributed at some time but not yet been awarded their lump sums. The different sizes of the projected fund do not imply different levels of strength or solvency. The value of the assets of the fund should in all cases be equal to the liability represented by the total of these individual account values. Provided the total investment income allocated is in all cases equivalent to the actual investment earnings less the administration charge, the NSF will operate satisfactorily.

**Acknowledgements**

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**Andrew George Young**  
**Fellow of the Institute of Actuaries**  
**October 2001**

## APPENDIX A

### Summary of Relevant Provisions of the NSF

- A.1. The NSF was introduced with effect from July 1994 by the National Savings Act 1995 ("the Act"). It provides lump sum payments in return for salary-based contributions.
- A.2. Section 4 of the Act states:
- The objects of the Fund shall be:
- (a) to provide for the payment of a lump sum to every employee on his retirement at the age of 60 or earlier, or on his or her death;
  - (b) to set up and operate for the benefit of employees, such schemes, including loan schemes, as may be prescribed.
- A.3. The Fund is compulsory in respect of all employees, including public sector employees. Contributions are paid by employers in respect of employees earning over the Lower Earnings Limit and up to an earnings ceiling, the Upper Earnings Limit. The employers' contribution rate is 2.5%. Employees do not contribute.
- A.4. The old age lump sums are payable at age 60 or, under certain conditions, on earlier retirement, including on medical grounds or on retirement from specific employments. The data showing the payments of lump sums on retirement provided for the review show that the lowest age at which a lump sum was paid was 36. As would be expected, the vast bulk of payments made before age 60 were to people in their 50's.
- A.5. Lump sums are also payable on the death of a contributor to the surviving spouse or children (if no surviving spouse) or other legal personal representative (if no spouse or children). (Section 14(5) of the Act)
- A.6. Lump sum payments are equal to the accumulated contributions together with the accrued interest as determined by an actuary. (Claims and Payments Regulations 1997)
- A.7. The Act and regulations also contain detailed provisions concerning the collection of contributions and various matters to do with the administration and running of the fund.

## APPENDIX B

### Summary of Revenue Accounts of the National Savings Fund

Rs millions

	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00
Fund before the start of year	0	247	575	948	1366	1829
<b><u>Income</u></b>						
Contributions from employers	242	293	303	324	331	375
Investment income	12	40	76	98	155	209
Capital Gains, etc	0	0	..	12	12	0
Other income	0	2	2	2	2	3
Total Income	254	335	381	436	500	588
<b><u>Expenditure</u></b>						
Lump sum payments	0	0	0	10	33	21
Administration charge	6	7	8	8	8	9
Other	..	..	0.5	..	..	2
Total Expenditure	6	7	8	18	42	33
Excess of income over expenditure	247	328	373	418	458	555
Fund balance at end of year	247	575	948	1366	1825	2385

Notes:

1. Figures may not add due to rounding.

2. The balance at the start of 1999/00 does not agree with the balance at the end of 1998/99. There was an adjustment of Rs +4.8 m to the balance shown in the Accounts for 1999/00.

3. The balance at the end of 1999/00 does not tally exactly with that shown in the Accounts. The Accounts show 2348.6 whereas the calculated figure using the other figures in the accounts is 2384.6. It would appear that there is a transcription error in the accounts and two figures have been transposed. The above table shows the figures as calculated from the detailed figures in the accounts.

**APPENDIX C**  
**Summary of data**

**TABLE C1**  
**NUMBERS OF CONTRIBUTORS IN EACH YEAR**

Age group	Thousands					
	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00
<b>Males</b>						
<20	5.8	6.2	6.2	6.3	5.9	2.2
20-24	24.4	24.7	25.3	25.9	24.6	10.6
25-29	29.7	28.4	27.8	26.3	25.3	9.8
30-34	30.9	31.6	31.1	30.5	28.1	10.8
35-39	30.2	29.8	29.5	29.4	28.3	11.4
40-44	28.1	27.6	28.6	28.3	27.5	9.6
45-49	21.0	23.6	24.8	25.8	25.5	8.0
50-54	14.4	14.9	15.9	17.2	17.1	5.3
55-59	11.0	10.9	10.9	10.7	11.0	3.4
60+	1.7	1.7	1.9	1.8	1.6	0.6
<b>Total</b>	197.2	199.7	201.9	202.1	194.9	71.7
<b>Females</b>						
<20	4.5	4.5	4.6	4.8	4.4	1.5
20-24	16.8	16.7	17.1	18.1	17.3	7.2
25-29	17.3	16.6	16.5	16.0	15.9	6.0
30-34	17.6	17.8	17.4	17.5	16.3	6.5
35-39	17.8	17.4	17.4	17.3	16.5	6.8
40-44	15.1	15.0	15.5	15.8	15.4	6.1
45-49	9.6	11.0	11.5	12.3	12.4	4.9
50-54	5.8	6.0	6.5	7.2	7.4	3.3
55-59	4.2	4.2	4.1	4.1	4.3	2.0
60+	0.6	0.6	0.7	0.6	0.6	0.3
<b>Total</b>	109.5	109.8	111.3	113.8	110.5	44.5
<b>Male + Female</b>						
<20	10.3	10.7	10.8	11.1	10.2	3.7
20-24	41.3	41.3	42.5	44.0	42.0	17.7
25-29	47.0	45.0	44.2	42.3	41.2	15.9
30-34	48.5	49.4	48.4	48.1	44.4	17.3
35-39	48.0	47.2	46.9	46.7	44.8	18.2
40-44	43.2	42.9	44.1	44.1	43.0	15.7
45-49	30.6	34.6	36.3	38.1	37.9	12.9
50-54	20.3	20.9	22.3	24.4	24.4	8.6
55-59	15.2	15.1	15.0	14.7	15.3	5.4
60+	2.3	2.3	2.6	2.4	2.2	0.9

**TABLE C2**  
**AMOUNTS OF CONTRIBUTIONS PAID IN EACH YEAR**

	Rs Million					
Age group	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00
<b>Males</b>						
<20	1.9	2.1	2.1	2.1	2.2	0.9
20-24	15.2	16.0	16.9	18.2	17.7	7.6
25-29	24.4	25.1	25.2	25.9	25.8	9.9
30-34	27.6	30.1	30.6	32.4	31.0	12.3
35-39	30.5	31.8	32.0	33.7	33.0	13.7
40-44	30.2	32.0	33.6	35.6	35.3	12.3
45-49	23.1	27.8	30.0	33.2	33.7	10.6
50-54	15.9	17.7	19.4	22.5	22.8	7.1
55-59	11.9	12.7	13.2	13.8	14.5	4.6
60+	1.0	1.1	1.2	1.2	1.1	0.4
<b>All Males</b>	181.6	196.3	204.5	218.6	217.2	79.3
<b>Females</b>						
<20	1.3	1.3	1.3	1.4	1.4	.05
20-24	8.8	9.2	9.9	11.0	11.3	4.8
25-29	11.0	11.8	12.4	13.2	13.8	5.4
30-34	10.9	12.0	12.4	13.7	13.7	5.7
35-39	11.7	12.4	12.7	13.4	13.4	5.7
40-44	10.0	11.1	12.0	13.2	13.6	5.0
45-49	6.5	8.0	8.8	10.1	10.7	4.0
50-54	4.1	4.6	5.2	6.1	6.5	2.6
55-59	2.9	3.1	3.3	3.4	3.7	1.5
60+	0.2	0.2	0.3	0.3	0.3	0.1
<b>All Females</b>	67.3	73.7	78.2	85.9	88.3	35.4
<b>Males + Females</b>						
<20	3.2	3.4	3.4	3.4	3.5	1.4
20-24	24.0	25.2	26.8	29.2	28.9	12.4
25-29	35.4	36.9	37.6	39.1	39.6	15.3
30-34	38.5	42.1	43.0	46.2	44.7	18.0
35-39	42.2	44.2	44.7	47.1	46.4	19.5
40-44	40.2	43.1	45.6	48.8	48.9	17.3
45-49	29.6	35.8	38.8	43.3	44.5	14.6
50-54	19.9	22.3	24.6	28.6	29.3	9.7
55-59	14.7	15.9	16.4	17.2	48.2	6.1
60+	1.2	1.3	1.5	1.5	1.4	0.5
<b>Total</b>	248.9	270.1	282.4	304.5	305.5	114.7

Notes The above Tables C1 and C2 excludes unknown and not yet posted data. The figures for 1999/00 are deficient due to substantial amounts of not yet posted numbers and amounts.

**TABLE C3**  
**ACCUMULATED CONTRIBUTIONS AND INTEREST**  
**AT 30 JUNE 2000**

Age group	Numbers of people ever paid Contributions (Thousands)	Accumulated contributions (Rs millions)	Accumulated Interest (Rs millions)
<b>Males</b>			
<20	2.4	0.8	0.1
20-24	31.9	39.4	9.5
25-29	36.1	107.7	35.4
30-34	36.8	147.9	51.7
35-39	38.1	169.5	59.7
40-44	34.2	176.8	63.2
45-49	30.7	172.1	62.2
50-54	23.8	137.3	50.2
55-59	15.2	85.7	31.6
60+	1.1	3.1	1.0
Total	250.3	1040.3	364.6
<b>Females</b>			
<20	1.8	0.5	0.1
20-24	24.3	24.8	5.9
25-29	26.4	61.7	20.4
30-34	24.5	67.9	23.7
35-39	24.6	68.7	24.0
40-44	22.1	69.4	24.7
45-49	18.0	59.4	21.4
50-54	12.2	40.8	14.7
55-59	6.8	22.9	8.3
60+	0.6	1.0	0.4
Total	161.3	417.3	143.6
<b>Males+ Females</b>			
<20	4.2	1.4	0.2
20-24	56.1	64.3	15.4
25-29	62.5	169.4	55.8
30-34	61.3	215.7	75.5
35-39	60.7	238.3	83.7
40-44	56.3	246.2	88.0
45-49	48.7	231.5	83.6
50-54	36.0	178.1	64.9
55-59	22.0	108.6	39.8
60+	1.7	4.2	1.4
Total	411.6	1457.6	508.2

Note Table C3 excludes unknown and not yet posted contributions. These figures are understated due to substantial not posted contributions and interest for 1999/00.

**TABLE C4  
NUMBERS OF PAYMENTS – 1999/00**

Age group	Thousands				
	Normal	Early	All	Death	All

ACTUARIAL REVIEW OF THE MAURITIUS NSF AS AT 30 JUNE 2000

	Retirement	Retirement	Retirements		Payments
<b>Males</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	Neg	Neg	Neg	Neg
40-44	0	0	0	0.1	0.1
45-49	Neg	Neg	Neg	0.1	0.2
50-54	0	0.1	0.1	0.2	0.3
55-59	Neg	0.2	0.2	0.1	0.4
60+	2.8	0.2	3.0	0.1	3.1
Total	2.8	0.6	3.4	0.7	4.0
<b>Females</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	0	0	Neg	Neg
40-44	0	0	0	Neg	Neg
45-49	0	Neg	Neg	Neg	Neg
50-54	0	Neg	Neg	Neg	Neg
55-59	Neg	Neg	Neg	Neg	0.1
60+	1.0	0.1	1.1	Neg	1.2
Total	1.0	0.2	1.2	Neg	1.3
<b>Total</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	Neg	Neg	Neg	Neg
40-44	0	0	0	0.1	0.1
45-49	Neg	Neg	Neg	0.1	0.2
50-54	0	0.2	0.2	0.2	0.3
55-59	Neg	0.2	0.3	0.2	0.4
60+	3.8	0.3	4.2	0.1	4.2
Total	3.8	0.8	4.6	0.7	5.3

**TABLE C5  
ACCUMULATED CONTRIBUTIONS IN RESPECT OF  
PAYMENTS – 1999/00**

Rs Millions					
Age group	Normal Retirement	Early Retirement	All Retirements	Death	All Payments
<b>Males</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	0.1	0.1
35-39	0	Neg	Neg	0.2	0.2
40-44	0	0	0	0.4	0.4
45-49	Neg	0.1	0.1	0.6	0.8
50-54	0	0.8	0.8	0.9	1.7
55-59	Neg	1.1	1.2	0.7	1.9
60+	11.3	0.7	12.0	0.2	12.2
Total	11.3	2.8	14.1	3.1	17.2
<b>Females</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	0	0	Neg	Neg
40-44	0	0	0	Neg	Neg
45-49	0	Neg	Neg	Neg	Neg
50-54	0	0.2	0.2	Neg	0.2
55-59	Neg	0.3	0.3	Neg	0.3
60+	2.9	0.1	3.1	Neg	3.1
Total	2.9	0.6	3.5	0.2	3.7
<b>Total</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	0.1	0.1
35-39	0	Neg	Neg	0.2	0.2
40-44	0	0	0	0.4	0.4
45-49	Neg	0.1	0.1	0.7	0.8
50-54	0	1.0	1.0	0.9	1.9
55-59	Neg	1.4	1.4	0.8	2.2
60+	14.2	0.9	15.1	0.2	15.3
Total	14.3	3.4	17.6	3.2	20.8

**TABLE C6**  
**ACCUMULATED INTEREST IN RESPECT OF**  
**PAYMENTS – 1999/00**

Rs Millions

Age group	Normal Retirement	Early Retirement	All Retirements	Death	All Payments
<b>Males</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	Neg	Neg	0.1	0.1
40-44	0	0	0	0.1	0.1
45-49	Neg	Neg	neg	0.2	0.3
50-54	0	0.3	0.3	0.3	0.6
55-59	Neg	0.4	0.4	0.2	0.6
60+	3.9	0.3	4.2	0.1	4.2
Total	3.9	1.0	4.9	1.1	5.9
<b>Females</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	0	0	Neg	Neg
40-44	0	0	0	Neg	Neg
45-49	0	Neg	Neg	Neg	Neg
50-54	0	0.1	0.1	Neg	0.1
55-59	Neg	0.1	0.1	Neg	0.1
60+	1.0	0.1	1.1	Neg	1.1
Total	1.0	0.2	1.2	0.1	1.3
<b>Total</b>					
<20	0	0	0	0	0
20-24	0	0	0	Neg	Neg
25-29	0	0	0	Neg	Neg
30-34	0	0	0	Neg	Neg
35-39	0	Neg	Neg	0.1	0.1
40-44	0	0	0	0.1	0.1
45-49	Neg	Neg	0.1	0.2	0.3
50-54	0	0.3	0.3	0.3	0.6
55-59	Neg	0.5	0.5	0.3	0.7
60+	4.9	0.3	5.2	0.1	5.3
Total	4.9	1.2	6.1	1.1	7.2

Note

Excluding any unknown and not yet posted amounts.  
Data may be deficient due to substantial not yet posted for 1999/00.

## APPENDIX D

### Projection of the resident population as at 30 June, 1999-2039 (with allowance for future migration)

Thousands

Age group	1999	2004	2009	2014	2019	2024	2029	2034	2039
<b>MALES</b>									
0-14	154.3	155.5	149.4	146.7	144.6	143.0	141.9	140.1	138.0
15-29	158.7	157.6	157.1	152.1	153.9	148.4	146.1	144.0	142.5
30-44	147.5	149.2	151.4	153.4	153.0	153.0	148.9	150.9	145.9
45-59	81.9	102.5	122.6	132.6	134.6	137.5	140.5	140.5	141.5
60-74	35.3	37.0	44.4	59.1	74.8	90.6	99.5	101.9	106.1
75+	8.9	11.1	12.0	13.3	15.1	19.2	27.0	34.5	41.8
All ages	586.6	612.9	636.8	657.3	676.0	681.7	703.8	711.9	715.8
<b>FEMALES</b>									
0-14	149.7	151.3	145.8	143.1	140.9	139.3	138.2	136.4	134.4
15-29	153.3	152.9	151.9	147.5	150.2	145.2	142.8	140.7	139.1
30-44	141	142.9	146.6	150.5	151.0	150.7	146.8	149.5	144.7
45-59	85.3	105.6	125.2	135.3	137.6	142.0	146.4	147.2	147.3
60-74	43.3	46.3	86.1	72.1	89.7	106.9	116.2	118.6	123.9
75+	15.2	18.9	20.8	23.3	26.2	32.1	42.2	51.4	60.6
All ages	587.8	617.9	646.3	671.8	695.6	716.2	732.5	743.8	749.9
<b>ALL</b>									
0-14	304.0	306.8	295.1	289.8	285.5	282.2	280.2	276.5	272.4
15-29	312.0	310.4	309.0	299.6	304.1	293.6	288.8	284.7	281.6
30-44	288.5	292.1	298.0	304.0	304.0	303.7	295.6	300.5	290.5
45-59	167.2	208.1	247.8	267.9	272.2	276.5	286.9	287.6	288.8
60-74	78.6	83.3	100.4	131.1	164.5	197.5	215.6	220.6	230.0
75+	24.1	30.0	32.8	36.6	41.3	51.3	69.2	85.9	102.3
All ages	1174.4	1230.8	1283.1	1329.1	1371.6	1407.9	1436.4	1455.7	1465.7

Source: CSO

## APPENDIX E ESTIMATING METHODS

This Appendix outlines the methodology and assumptions used in the projections of income and expenditure.

### CONTRIBUTORS AND CONTRIBUTIONS

E.1 The proportions of the population in respect of whom contributions are paid to the NSF were obtained by comparing the numbers of contributors with the population in each year from 1994/95 to 1999/00. The analysis was carried out by single age and separately for men and women. The proportions calculated from the data were much lower for 1999/00. The data for this year are clearly deficient in the numbers of contributors recorded by the date the data were extracted. The 1998/99 data also appeared somewhat deficient when compared with the figures for earlier years. It was therefore decided to use the average proportions obtained from the years 1994/95 to 1997/98 as the basis for the projections, with some allowance for smoothing of the proportions calculated from the raw data.

E.2 **Table E1** below shows the assumed proportions of the population contributing to the NSF.

**TABLE E1  
PROPORTIONS OF POPULATION CONTRIBUTING TO THE NSF**

Age group	Males	Females	Total
18-19	0.274	0.211	0.243
20-24	0.496	0.352	0.425
25-29	0.570	0.362	0.468
30-34	0.580	0.347	0.468
35-39	0.621	0.381	0.504
40-44	0.682	0.382	0.534
45-49	0.718	0.331	0.525
50-54	0.700	0.266	0.478
55-59	0.644	0.223	0.422
60	0.560	0.174	0.354
Total	0.592	0.333	0.464

E.3 For men, the proportions contributing initially increase steeply with age, then more gradually from around age 40 with a maximum proportion contributing of just over 70% of the population. From age 55 onwards, the proportion then slowly declines. In contrast, for women the proportions remain lower, never exceeding 40% and start to decline from around age 45. Overall around half of the population are contributing at the peak ages.

E.4 These factors represent the proportions which contribute in a particular year. The same individual may or may not contribute in other years. The proportions reaching age 60 who have at some point during their working lives paid contributions are therefore likely to be

much higher than the maximum shown in **Table E1**. Indeed it is likely in the longer term that virtually all men and the majority of women will have contributed at some stage during their working lives, even if in some cases only for a few years.

E.5 To determine future numbers of contributors, the above proportions are applied to the population projection numbers by single age and sex.

E.6 The average amounts of contributions paid per contributor on an age and sex specific basis were also determined for each of the years 1994/95 to 1999/00. These averages are affected by the general increases in earnings and changes to the upper limit for contributions. In order to examine the changes in the averages in constant terms, adjustments were made to bring the average for each year up to that for 1999/00. From this, the assumptions for the average contribution per contributor were derived and used for the projections.

E.7 Using the numbers of contributors and the average amounts from the detailed data, an estimate of the total amount of contributions for 1999/00 was made. This result was compared with the contributions data, including the amounts “not yet posted” and “unknown”, and adjustments made to the average amounts to include allowance for these in order to make the final detailed factors consistent with the overall contribution income.

E.8 **Table E2** shows the average amounts of contributions per contributor in 1999/00 terms after the adjustments for unknown and not yet posted contributions:

**TABLE E2**  
**AVERAGE AMOUNTS OF CONTRIBUTIONS PER YEAR PER CONTRIBUTOR**

Age group	Rs 1999/00 terms		
	Males	Females	Total
18-19	416	362	393
20-24	803	726	772
25-29	1108	952	1049
30-34	1212	912	1105
35-39	1319	921	1172
40-44	1427	957	1261
45-49	1468	952	1306
50-54	1478	978	1335
55-59	1460	961	1321
60	777	535	713
Total	1236	882	1110

E.9 For men, the average amounts increase with age steeply at the younger ages, and then more gradually and are relatively constant from age 40 onwards. The average amounts for women are considerably lower (overall about 70% that for men) and show only minor changes from age 25.

E.10 To determine the future amounts of contributions, the average amounts shown in **Table E2** above are applied to the numbers of contributors (paragraph E5) with further adjustments to allow for future increases in average earnings.

## **ACCUMULATED CONTRIBUTIONS AND INTEREST AT JUNE 2000**

E.11 The data provided on accumulated contributions and interest at June 2000, shown in Appendix C **Table C3**, is deficient in respect of the amounts for 1999/00 and adjustments were made to allow for this based on the difference between the actual known contributions for 1999/00 and the estimated contributions (as determined in paragraph E.7) and making some extra further minor adjustments for other estimated contribution income.

E.12 **Table E3** shows the estimated accumulated contributions and interest after these adjustments for late postings of data in respect of 1999/00. It should be emphasised that these include the adjustments made for the deficiencies in the data for that year and are therefore estimates.

E.13 The figures in **Table E3** formed the baseline for the accumulated contributions and interest at 30 June 2000. This total agreed reasonably well with the total balance in the fund as at June 2000.

**TABLE E3**  
**ESTIMATED ACCUMULATED CONTRIBUTIONS AND INTEREST**  
**AT 30 JUNE 2000 ADJUSTED FOR NOT POSTED DATA**

Age group	Accumulated contributions (Rs millions)	Accumulated Interest (Rs millions)
<b>Males</b>		
<20	2.0	0.2
20-24	55.5	10.8
25-29	135.0	38.9
30-34	180.6	56.5
35-39	208.9	65.2
40-44	220.2	69.2
45-49	213.7	68.0
50-54	169.2	54.8
55-59	105.1	34.4
60+	4.9	1.2
<b>Total Males</b>	<b>1295.2</b>	<b>399.3</b>
<b>Females</b>		
<20	1.3	0.1
20-24	35.0	6.8
25-29	76.3	22.4
30-34	81.6	25.8
35-39	84.8	26.2
40-44	85.3	27.0
45-49	71.7	23.2
50-54	48.8	16.0
55-59	27.5	9.0
60+	1.5	0.4
<b>Total Females</b>	<b>513.2</b>	<b>157.0</b>
<b>Males + Females</b>		
<20	3.3	0.3
20-24	90.5	17.6
25-29	211.3	61.3
30-34	262.3	82.3
35-39	293.7	91.5
40-44	305.5	96.2
45-49	285.4	91.3
50-54	218.0	70.8
55-59	132.6	43.4
60+	6.3	1.6
<b>Total</b>	<b>1808.9</b>	<b>556.3</b>

**PAYMENTS**

E.13 Detailed data on payments made were available only for 1999/00. This showed the numbers of lump sum payments and amounts of payments (accumulated contributions and interest) split by sex and single age and between

- Age retirements (The vast majority of whom were 60 or more)
- Early retirements
- Deaths

E.14 Because the data on accumulated contributions up to 1999/00 is deficient, it is likely that the payments data is deficient in respect of recently paid contributions.

E.15 Rates of retirement by age and death were derived by comparing the payments with the data on accumulated contributions and interest. The accumulated contributions were adjusted approximately to determine an estimated cumulative level at the start of the year and allowance was made for the payments being made part way through the year.

E.16 The following tables show the assumed rates for accumulated contributions and interest payments by age based on this analysis of the data:

**TABLE E4  
ASSUMED RATES OF PAYMENT FOR LUMP SUMS ON DEATH**

Age group	Males	Females	Total
18-19	0.0000	0.0000	0.0000
20-24	0.0002	0.0004	0.0003
25-29	0.0002	0.0001	0.0002
30-34	0.0006	0.0003	0.0005
35-39	0.0012	0.0003	0.0009
40-44	0.0019	0.0004	0.0015
45-49	0.0038	0.0005	0.0030
50-54	0.0069	0.0012	0.0056
55-59	0.0086	0.0019	0.0072
60	0.0070	0.0019	0.0059

**TABLE E5  
ASSUMED RATES FOR PAYMENT OF LUMP SUMS ON EARLY RETIREMENT**

Age group	Males	Females	Total
18-34	Nil	Nil	Nil
35-39	0.0000	Nil	0.0000
40-44	0.0000	Nil	0.0000
45-49	0.0010	0.0005	0.0008
50-54	0.0063	0.0045	0.0059
55-59	0.0132	0.0114	0.0129

**TABLE E6**  
**ASSUMED RATES FOR PAYMENTS OF LUMP SUMS ON AGE RETIREMENT**

Age group	Males	Females	Total
60	0.9556	0.9554	0.9555
61	1.0000	1.0000	1.0000

E.17 The data used to derive the above factors were based on the 1999/00 experience. It should be noted that the above rates are in respect of the amounts of lump sum payments, not the numbers of people awarded lump sums. They represent the proportion of the total accumulated account entitlements at each age which will be paid out for the different contingencies rather than the proportion of people who will receive payments.

E.18 The rates of mortality (**Table E4**) used to estimate the awards of lump sums on death are considerably lower than the actual population mortality at these ages. This is to be expected since all the cases must have been in work and contributing during the last 5 years or so in order to have accumulated any contributions in the Fund. They are therefore likely to have lighter mortality than the general population. It is possible that in the longer term the rates for death might increase and become somewhat closer to the population rates; however it is also likely that there will always be some element of selection in the mortality rates in respect of deaths before age 60 so they will remain somewhat lower than the population mortality rates.

E.19 For age retirements, it is assumed that the majority will take the lump sum payments at 60 and any residual cases will retire by the time they reach 61.

E.20 For simplicity, other exits are assumed to be nil at present. Such other exits before normal age retirement could readily be allowed for in the projection provided appropriate assumptions or data were available. However, as the lump sums are always equal to the amount in an individual's balance, any changes to the rules affecting the age at which the lump sums might be paid would not have any impact on the viability of the NSF. It would nevertheless affect the annual cash flow by bringing forward in time some of the lump sum payments. The financial impact would depend on the importance of any such early payments when compared with the total accumulated entitlements in the individual accounts. This would affect the size of the Fund relative to the contribution income and the year by which the lump sum payments first exceeds the contribution income. The greater the number of ways in which people might have access to all or some of their lump sum entitlement, the lower will the Fund tend to be as a multiple of the contribution income.

E.21 It should be emphasised that the rates for payments are based on the data for 1999-00 only, and at a very early stage of the scheme. They are therefore not yet mature and are therefore subject to higher uncertainty than normal. Furthermore the data on payments from the statistics did not fully reconcile with the actual payments shown in the Accounts. Inevitably there are time lags in both the payments of lump sums and in the system for recording the payments on the data base from which the statistical information was derived for the review. These time lags in recording affect the comparison between the figures recorded in the accounts and the statistical information. The factors used in the projections are therefore subject to some uncertainty. However, it remains a fact that the bulk of payments will be made on age retirement at 60. Any difference between the assumed factors and the actual experience in future for deaths and early retirements will be offset by compensatory effects on age retirements at 60 in later years.

## PROJECTIONS OF LUMP SUM PAYMENTS

E.22 Future estimates of the amounts of payments are determined by applying the rates shown in **Tables E4, E5 and E6** to the accumulated amounts of contributions and interest at the start of each year plus half the contributions and interest earned in the year of payment.

E.23 The future accumulated contributions at the end of each year are taken as the accumulated contributions at the start, plus contributions accruing in the year less the contributions element of payments made in the year. Similarly future accumulated interest at the end of each year is taken as the accumulated interest at the start, plus a full year's interest earned on the accumulated fund at the start of the year, plus a half year's interest on the contributions paid in the year less the interest element on payments made during the year.

E.24 **Table E7** below shows further details of the estimated contributions and payments in future based on the main economic assumption used for the estimates in Section 6. It is not possible to estimate reliably the numbers of payments, only the amounts of accumulated contributions and interest. The numbers of payments in a year are likely to be higher than the average numbers of contributors in past years for the cohort, because some people may not have been contributing in the year they died or retired, but will have been contributing in an earlier year. Similarly, it is not possible to determine the average number of years an individual is likely to have contributed over his or her working life. However, given the proportions contributing (see **Table E1** above) it is likely that virtually all men will have paid contributions at some time by the time they reach 60 and similarly the majority of women are likely to have contributed.

**TABLE E7**  
**AMOUNTS OF CONTRIBUTIONS AND ANALYSIS OF PAYMENTS**

Rs millions in 1999/00 terms

	2000-01	2004-05	2009-10	2014-15	2019-20	2024-25	2029-30	2034-35	2038-39
<b>Contributions</b>	389	450	521	592	662	728	802	886	950
<b>Payments</b>									
<b>Deaths</b>									
Accumulated Contributions	5	9	16	23	30	36	42	48	51
Interest	1	3	7	12	18	25	31	38	40
<b>Deaths Total Expenditure</b>	6	12	23	35	49	61	73	86	92
<b>Early Retirement</b>									
Accumulated Contributions	4	8	16	24	33	39	46	57	60
Interest	1	3	7	13	22	31	40	51	54
<b>Early Retirement Total Expend.</b>	5	11	23	38	55	70	86	108	114
<b>Age Retirement</b>									
Accumulated Contributions	27	52	123	188	290	397	443	544	640
Interest	9	18	59	111	200	332	434	589	702
<b>Age Retirement Total Expend.</b>	36	70	181	299	491	729	877	1133	1342
<b>All Payments</b>									
Accumulated Contributions	36	69	155	236	354	472	531	649	752
Interest	12	24	72	136	241	387	505	678	796
<b>All Payments Total Expend.</b>	47	93	227	371	594	860	1036	1327	1548

Note: Individual figures may not add up to subtotals or totals due to rounding.

**OTHER ASSUMPTIONS UNDERLYING THE PROJECTED FUND BALANCE**

E.25 **Table 3** in Section 6 shows the projected income and expenditure for selected years and the balance of the fund of the NSF.

E.26 As the results in **Table 3** are shown in constant price terms, the Investment income was calculated using the assumed real rate of return. For the main projection in **Table 3** the real rate of investment return is 4.04%, derived from the assumed average real earnings increase of 2% and the rate of investment return of 2% in excess of earnings. This rate was applied to the average balance of the fund in the year. The rate of interest allocated to the

individual accounts was assumed to be consistent with the investment return earned, so that the total investment income after deduction for administration expenses was allocated to individual accounts.

E.27 Administration expenditure is assumed to be 2.5% of contribution income. See paragraphs 5.18 to 5.20 for further comments on the administration expenses.