Actuarial Valuation of the National Social Security and Insurance Trust as at 31 December 2004

Sierra Leone

FINAL REPORT

Régie des rentes du Québec

Direction de l'évaluation et de la révision
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Executive summary

The Sierra Leone long term benefits social security system covered about 103 000 workers in 2004. The system assures good protection to the work force concerning old-age, disability and death. However, the coverage of the private sector is very low and the NASSIT should continue its efforts to attract them into the scheme. The scheme is currently in good financial condition, the investment policy is adequate and there is a willingness on the part of management to make the existence of this new scheme a success (we saw during this review many high quality internal papers regarding the scheme).

The scheme is relatively young. It started its operations in 2002. Because of the long term nature of its benefits, it will take time to reach a state of maturity and the cost of pensions expressed as a percentage of insurable earnings will continue to increase. The annual expenditure represents, in 2005, 6.0 % of insurable earnings and projections indicate that it will gradually increase to 28.1 % in 2054. If the scheme had to be financed by a constant contribution rate over the next 50 years, this rate (the general average premium, or GAP) would be 17.5 %. The GAP may be compared to the current contribution rate devoted to pensions, which is 15.0 % of insurable earnings for the private sector and 17.5 % for the public sector.

The reserve ratio (reserve expressed as a ratio of annual expenditures) is presently 9.5. It will be higher than 3.0 until 2045. The reserve will be exhausted in 2052, on the basis of the assumptions established for this valuation. Contributions rates are adequate to finance the scheme over a period of 20 years (defined as the equilibrium period). Therefore, there is no emergency for adjusting the contribution rate in the very short-term. It is, however, recommended that a regular and orderly mechanism for future contribution rate increases be adopted.

Indicators of the financial condition of the scheme

	Year of reserve exhaustion	PAYG* cost in 2054	General average premium
basic scenario	2052	28.1 %	17.5 %

* Pay-as-you-go

Despite this favorable situation, there are some elements that deserve more attention:

- The scheme is young and it is normal that the level of administrative costs is high. Starting expenses are normally high and would decrease in the future. It is also important to note that, administrative expenses compared to insurable earnings are higher than the level expected in the inception report (3.5 % compared to 1.0 %). Even that, the scheme is financially sound. However, as a good governance practice, we suggest NASSIT puts in place for the future, a formal follow-up process of the administrative expenses that include establishment of a target on the level of administrative expenses. According to NASSIT this target may be implemented at the end of the transitional period.
- Since the inception of the scheme, there are no pensions in payment among new beneficiaries. Only grants benefits have been paid, even for beneficiaries who meet the eligibility conditions to obtain a pension. The reason is that past service for workers in the public sector were not known and validated at the moment the applications for

pensions were made. This situation may create an administrative burden and an inequity of treatment. In fact, it is not because grants have been paid that participants are not entitled to a pension. Also, even if a participant is not entitled to a pension, the real amount of a grant may be higher if the entire credited past service is taken into account. We encourage the NASSIT to give priority to recalculation of the benefits for people who died, retired or became disabled since the inception of the plan by taking into account total credited past service.

- For the next equilibrium period of 20 years, the current contribution rate for the public sector is almost adequate while the one for the private sector is too high (15 % compared the required rate of about 5 %). There is thus enough room in the contribution rate to adopt a grandfathering provision for the private sector to take into account past service. This will increase the degree of equity in the scheme between participants in the public sector and participants in private sector. We suggest the following approach:
    - Additional service credit granted at the time of affiliation (from 2002 to the end of 2006)
        - To qualify:
            - At time of affiliation, age must be over 30 years and;
            - At the end of 2006, the participant must have contributed to the scheme during at least 27 months of the first 36 months of his affiliation.
        - Additional service granted:
            - Half of the period between the age at the time of affiliation and age 30.

This actuarial report highlights some issues that also deserve attention:

- The next valuation will be very important because more scheme experience should be available to increase precision in the analysis and the valuation.
- We encourage the NASSIT to continue its effort to input participant's data in the NAPOS system and to update continuously this information.
- The terms of reference asked us to compare the provisions of the scheme with the standards of the International Labour Office (Convention 102). In our opinion, the scheme is well designed compared with this convention except for the transitional rule in the private sector that does not recognize a certain numbers of years of past service.
- As requested in the terms of reference, this report presents factors that should be used in the determination of the purchase price of additional credits for people in the private sector.
- Proposal for elimination of the reduction factor for early retirement for military personnel and police represents an additional charge for the scheme. We suggest that contribution rates for these two groups be increased by 2 % to allow a retirement at age 55 without the application of a reduction factor.

Introduction

Article 47 of the *National Social Security and Insurance Trust Act, 2001* requires that the scheme be evaluated every three years during the first ten years of the scheme by an actuary. After this period, the scheme must be evaluated every five years. This is the first actuarial valuation of the National Social Security and Insurance Trust (NASSIT) since the implementation of the pension scheme in 2002. The actuarial valuation date is 31 December 2004.

The actuarial valuation was carried out under the terms of an agreement concluded between the NASSIT and the Régie des rentes du Québec (RRQ). The RRQ assigned Mr. George Langis, F.S.A, F.I.C.A, of the Régie des rentes du Québec to carry out this valuation. Mr. Langis went to Freetown from 2 October to 9 October 2005 to collect the data necessary for the valuation in collaboration with the personnel of the NASSIT. During work in Québec, Mr. Langis was assisted by Mr. Martin Bernard, A.S.A, MBA for certain parts of the present project. Mr. Patrick Therrien, A.S.A, also gave a hand in the analysis of the investment policy. Mr. Pierre Plamondon, F.S.A, F.I.C.A., chief actuary of the Régie des rentes du Québec, revised the results of this actuarial evaluation. This report has been reviewed by the Governance, Finance and Actuarial Service of the International Labour Office.

This report is divided into four chapters. The first chapter presents the scheme's experience since its inception. The second chapter concentrates on the data collected as well as on the economic, demographic assumptions and others assumptions of projection particular to the NASSIT. The third chapter presents the results of demographic and financial projections according to legal provisions' as of the date of evaluation as well as several sensitivity analysis. In the fourth chapter, one finds final comments on the valuation.

The author want to thank the Director-General of the NASSIT, Mr. EDMUND KOROMA for his hospitality, his support and for placing at our disposal qualified resources, all of which facilitated the production of this actuarial analysis.

During our visit to Sierra Leone, we met several organizations or partners that are concerned with the viability of the scheme. We received a lot of comments and suggestions. This actuarial valuation will take into account most of these comments or preoccupations.

1 Experience of the system since inception

This chapter presents an analysis of the results of the NASSIT from 2002 to 2004. The study was carried out in eight stages:

· Description of the legal framework of the NASSIT;
· Description of the covered population;
· Analysis of income and the expenditures;
· Analysis of the administrative costs;
· Structure and return of the portfolio of investment and policy of investment;
· Description of the financial system and the level of the reserve (fund);
· Analysis of the experience of the scheme since its inception;
· Conformity of the NASSIT with Convention 102;

1.1 Legal framework of the NASSIT

The legal framework in which evolves the NASSIT is constituted by:

· The *National Social Security and Insurance Trust Act, 2001*;
· The *National Social Security and Insurance Trust Regulations, 2004*.

The social security system of Sierra Leone offers a protection against risk related to old age, death, and disability as well as the risk related to occupational diseases and work-related injuries. The actuarial valuation will cover only the scheme for long-term pensions (old-age, disability and survivor benefits)

Income into the pension scheme results from three sources:

- Contributions from employers and workers;
- Investment income;
- Penalties because of delays in the payment of contributions or in transmission of the statements (declarations) of salary

The NASSIT also receives a contribution from the State dedicated to paying pensions to former civil servants that were already in payment at the scheme's date of inception. The NASSIT is responsible only for administering the payment of these pensions. According to an agreement between the government and the NASSIT, the later is reimbursed for the cost of pensions plus the administrative costs related to this function.[1]

There are two types of expenditures:

· Benefits payments;

[1] Government pensions were a non-contributory scheme financed through the consolidated fund. In May 2004, the government asked NASSIT to take over the payment of these pensions.

· Operating and investment costs.

Benefits are of three types: retirement, survivor and disability benefits. These benefits are long-term in nature but there are several grants which are also paid to participants. Appendix 1 presents a detailed description of the provision of the scheme administered by the NASSIT.

Costs related to the operations of the NASSIT are analyzed in section 1.4. They include salaries to employees, overhead, expenditures linked to auditing, etc.

1.2 Covered population

By law, all workers in Sierra Leone are covered by the NASSIT. Self-employed workers can join the scheme on a voluntary basis. Participation in the NASSIT dates since 1 January 2002. Before 2002, almost all the government employees were covered by a non-contributory pension scheme which guaranteed a retirement pension at 55 years-old. Some workers in the private sector were covered by a provident fund.

Table 1 illustrates the distribution of the covered population as of the 31 December 2004.

Table 1 Distribution of the covered population as at 31December 2004

Covered population	Number
Public sector	65 401
Teachers	25 154
Military personnel	14 150
Police	7 789
Civil servants	15 256
Subsidized institutions	3 052
Private sector	38 037
Total	103 438

For the rest of this report, reference to the private sector also includes scheme participants in subsidized institutions.

Participants in the public sector and those in the private sector are entitled to the same benefits. However, there is an important element that distinguishes these two categories of workers. Past service before the inception of the scheme are credited in the calculation of the benefits for workers in the public sector only. To recognize this, the government agreed to pay an additional contribution rate of 2.5 % for 20 years. There is also a provision for the employees in the private sector that gives them the opportunity to purchase additional services to meet the eligibility conditions. A section in the present report will discuss the case of the recognition of credited past services for employees of the private sector.

Recently, Statistics Sierra Leone[2] published information concerning the population employed in Sierra Leone. We can compare this population with the population covered by the NASSIT to see if there is potential growth in the future. Table 2 shows the distribution of the employed population.

Table 2 Distribution of the employed population

Covered population	Number
Public sector	**72 222**
Private sector	**1 828 361**
Private formal sector	98 830
Private informal sector	1 729 531
Total	**1 900 583**

(Calculation by the author.)

A comparison of Table 1 and Table 2 shows that there is no room for a large increase in coverage in the public sector. In fact, the two numbers are close (65 401 versus 72 222). However, it is not the same in the private sector. Only 38 037 persons from this sector are covered by the NASSIT compared with a potential number of 98 830.[3] The actuarial valuation recognizes this element by using a higher growth rate for the covered population in the private sector than for the one in the public sector.

1.3 Analysis of income and expenditures

1.3.1 Statement of account, general scheme

Table 3 presents the Statement of account for the three-year period from 2002 to 2004. According to the Statement, contribution income increased steeply, by almost 150 %, between 2002 and 2003 and decreased between 2003 and 2004. Investment income was multiplied by 50, due to the growth of the invested funds. Other income remains marginal. Costs are at 95 % linked to administrative costs.

[2] Report based on the "Employment and Time Use" module of the Sierra Leone Integrated Household Survey, SLIHS 2003-2004

[3] We estimate that 59 000 of the 98 830 are from paid employment and the balance from self employment.

Table 3 Statement of account, 2002-2004, in millions of leones

	2002	2003	2004
Total income	**12 807**	**34 452**	**40 228**
Contributions received	12 505	30 327	28 891
Investment Income	289	4 121	11 328
Other income	13	4	9
Total expenditures	**1 691**	**3 304**	**6 718**
Benefits paid	0	54	311
General and administrative costs	1 691	3 250	6 407 [4]
Surplus	**11 116**	**31 148**	**33 510**

Figures in Table 3 exclude amounts related to the payments of pensions and administrative costs for former civil servants pensioners as at the inception of the scheme. The reason for this exclusion in our analysis is that the nature of the agreement between the NASSIT and the government is a contract for service only. The NASSIT assumes no risk by taking in charge these payments. According to an agreement between the government and the NASSIT, the later is reimbursed for the cost of pensions plus the related administrative costs. In 2004, the NASSIT received, from the government, 4 618 million leones for the cost of pensions plus an amount of 519 million leones for administrative costs linked to these benefits. On the expenditures side, in 2004, the NASSIT paid 3 765 million leones in pension benefits to former civil servants.

However, numbers in Table 3 include the additional contribution from the government to assume past service for these employees. Starting in January 2004, the government will pay an additional contribution of 2.5 % of the total contributory salaries during 20 years. The State began to actually make this special contribution in May 2004. An amount of 5 065 millions leones is still owed to the NASSIT for the first four months of 2004.

1.3.2 Benefits in payment

Since the inception of the scheme, there are no pensions in payment among new beneficiaries. Only grant benefits have been paid, even for beneficiaries who meet the eligibility conditions to obtain a pension. The reason is that past service for the public sector employees was not known and validated at the moment when the pension applications were made. Only the length of credited service since the inception of the scheme was taken into account for the calculation of the amount of grant. This situation may create an administrative burden and an inequity of treatment. In fact, it is not because grants have been paid that participants are not entitled to a pension. Also, even if a participant is not entitled to a pension, the real amount of a grant may be higher if the entire credited length of service is taken into account.

[4] In 2004, the total general and administrative costs of 6 925 millions of leones in the Income and Expenditure Account are reduced by an amount of 519 millions of leones to take into account the costs related to the administration of the current pensions of former civil servants.

In 2005, the NASSIT has undertaken an exercise of validation for credited service for all participants in the public sector. During our visit to Freetown, there were nearly 5 000 validation forms that had been transmitted to the NASSIT. It became important to know the actual years of participation for all participants and take that into account when necessary. However, we suggest that emphasis for the validation of past service be given to participants who died, retired or became disabled since the inception of the scheme. In fact, those participants or their beneficiaries are actually entitled to a pension based on the actual years of credited service. A prompt recognition of these acatual years of service will allow people to rapidly receive what they are really entitled to.

The difference between the real amount of pensions or grants that must be paid and the one that was actually paid by the NASSIT since January 2002 represents a liability for the NASSIT. For our report, we estimate the amount of benefits that would have been paid if the complete numbers for credited service had been known and used it in the actuarial valuation. We also decrease the initial amount of the reserve by 167 407 056 leones to take into account those liabilities. This figure is obtained by transforming amounts of grant paid into pension payments that take into account the average past service as described in section 2.4.2 (Past service).

When the true number of years of credited service becomes known for a participant or beneficiary, we suggest that the recalculation of the pension or benefits take into account the interest rate between initial date of payment and the date at which the new payment and adjustment are made. The average Treasury bills rate during the period could be used for that interest rate. By example, if a grant of 500 000 leones was paid and 1.5 years after, a real grant of 2 500 000 is recalculated by taking into account the real number of years of credited service, the following payment should be made to the participant:

$$(2\,500\,000 - 500\,000) \times (1.2)^{\mathbf{1.5}} = 2\,629\,068,$$ where 20 % is the interest rate.

1.4 Analysis of administrative costs

1.4.1 The NASSIT situation

Table 4 shows the evolution of administrative costs since inception of the scheme. In the inception report, the ILO proposed an estimate of 1 % of insured earnings for administrative costs.

Table 4 Nature of costs, 2002-2004, in millions of leones

Nature of costs	2002	2003	2004
Director fees and allowances	59	64	188
Depreciation	167	357	549
Staff costs	899	1 838	3 997
Provision for audit fees	-[5]	28	33
General costs	543	963	2 159
Sub-Total	1 691	3 250	6 926
Administrative costs (former civil servants)	-	-	519
Total	**1 691**	**3 250**	**6 407**
Estimated insurable earnings	83 367	202 182	208 263
Target: 1 % of insurable earnings	834	2 022	1 926
Excess compared to target*	857	1 228	4 481

*1.0 % of insurable earnings, as set in ILO report.

Table 4 shows by how much costs exceed the assumption established by the ILO. According to this organization, cost exceeds the assumption by 4.5 billion Leones in 2004, or by a proportion of 230 %. The variance in the assumed level at the inception (1.0%) and the actual outturns (3.1%) could be explained by higher expenditures that were required to achieve the Trust's corporate objectives.

Table 5 shows that administrative costs have increased considerably in 2004 as compared to 2003 and even more since 2002. This increase is not matched by inflation or by depreciation of the currency. Inflation was only 8 % in 2003 and currency has decreased by 15 % between 2003 and 2004.

The most important item is staff costs, which represent more than 55 % of total expenditures. A second item, general costs, represents 30 % of total expenditures. These proportions remain more or less constant over the three-year period 2002-2004. Therefore, the overall increase in administrative costs is not related to a single post. Each budget item contributed to this increase. However, considering the size of the two items mentioned above, a more detailed analysis of the reasons for the cost increase should focus on them.

[5] In 2002, separation of costs between general costs and provision for audit fees was not provided.

Table 5 Administrative costs expressed as a proportion of several indicators, 2002-2004

	2002	2003	2004
As a % of contribution income	13,5 %	10,7 %	24,0 %
As a % of total benefit expenditures	100,0 %	98,4 %	95,4 %
As a % of insurable earnings	2,0 %	1,6 %	3,1 %

When compared to insurable earnings, administrative costs of the NASSIT turned out to be relatively high, at 3.1 % in 2004. Also, when we analyze the budget for 2005, there is an indication that the administrative costs will continue to increase. According to a revised estimate, administrative costs could be as high as 5.0 % of the insurable earnings for 2005.

The NASSIT being a young scheme, it is normal that the administrative costs at the beginning of a scheme are higher than those of a mature scheme. Comparisons regarding administrative costs between countries are difficult due to factors like scheme's level of development, coverage level, and level of insured earnings. Some countries in Africa have administrative fees around 2 % of their insurable earnings.

According to the NASSIT, the following reasons explain the high administrative fees:

- Delayed expenses during the early years of the Scheme. Thus administrative expenses shot up in 2004 and 2005 to make up for expenses that should have been incurred during the first two years of operations of the Scheme.
- The inception actuarial report states that the initial capital expenditure such as acquisition of office space and other monthly expenses in the first few years (i.e. until the fund is properly established) may have to be met by Government. This has not been the situation as the NASSIT has been self-financing its operations since inception.
- Initial seed money of Le 4.5 billion provided by the Government for the setting up of the Scheme was fully refunded by the end of the third year.
- In general, increase in administrative expenses occurred due to the priority given to:
  - Advertising to promote greater awareness and understanding and acceptance of social security principles and practise and confidence in the national scheme; and
  - Training in core operational processes and procedures provided to staff, including technical assistance for the training in NAPOS and other IT software.

In an organization like the NASSIT, as a good governance practice, it is necessary to put in place controls on the administration process. We suggest that the NASSIT put in place a target on administrative costs to be attained in a given number of years. Such a target should be used by the Board as a warning signal, beyond which it will indicate that the scheme administration is inefficient or nearly so. According to NASSIT this target may be implemented at the end of the transitional period. It is important to specify that the NASSIT is actually considering to link increases in administrative expenses to inflation from year 2007 and beyond which will help to control expenses..

1.4.2 General principles

For a mature scheme, administrative costs usually represent a rather low proportion of the overall insurable earnings. In a starting scheme, obviously, several costs are incurred that are linked to the initiation of the scheme: staff training, building the IT structure, implementation of a mechanism to collect contributions and pay benefits. Therefore, there is no ready mechanism available to assess the appropriateness of administrative costs at the inception of a scheme.

However, several useful tools can be considered in order to assess benchmarks that help fully appreciate the size of these expenditures. Ratios are used in many countries as limits that cannot be exceeded. These ratios are:

- Administrative costs / contribution income: this ratio is sensitive to the contribution rate. As this contribution rate will probably evolve during the scheme's lifetime, it has to be used carefully. It is also sensitive to the size of the covered population, or limits to insurable earnings.
- Administrative costs / insurable earnings: more robust than the previous ratio, this one was proposed as a benchmark in the report from the ILO. However, as insurable earnings are usually increasing at a higher pace than inflation, this may lead to relatively high administrative costs in relative and absolute value over the long term. It is sensitive to the inclusion/exclusion of new groups of covered persons (for example, teachers, or civil servants, or military personnel). It can also be influenced by an eventual limit on insurable earnings.
- Administrative costs / benefits expenditures: For a scheme that is not mature, this ratio is not recommended, as benefit payments are very low at the inception of the scheme, unless very sizeable transitory measures are put in place. This ratio will naturally decrease steeply as benefits grow, but will by no mean signify that a more efficient administration exists. This ratio is also affected by adjustments to benefits following, for example, a reform in the pension system..
- Annual increase limited to inflation: this option may be interesting several years after inception of the scheme. Before this benchmark is considered, any costs related to the inception of the scheme should be reduced to their minimum, and a careful analysis of relevant expenditures should also be made.

1.5 Structure and rate of return on the investment portfolio and investment policy

1.5.1 Portfolio analysis

As of 31 December 2004, the total assets of the NASSIT on the balance sheet represent an amount of 82.0 billion leones, after amortization. Three important components form the assets of the NASSIT.

- Long-term investments, which represent 8,8 % of the total assets and are composed principally of an investment in Sierra Leone Blocks Concrete Products Limited (6,6 billion leones in stocks);
- Short-term investments which represent 81,4 % of the total assets and are composed principally of Treasury Bills and Treasury Bonds (63,7 billion leones);
- Collectibles which represent 5,3 % of the total assets and are composed mainly of receivables (3,2 billion leones are interest receivable)

As at 31 December 2004, on the balance sheet there is a total liability of 5.4 billion leones, of which 85 % is interest on Treasury Bills/Bonds.

Table 6 Asset value as at end of fiscal year, 2002-2004, in millions of leones

	31 December 2004	% 2004	31 December 2003	31 December 2002
A) Long-term Investment	7 188	8.8 %	-	-
B) Fixed assets	1 978	2.4 %	1 048	967
C) Current assets				
Short-term investments	66 731	81.4 %	40 746	13 934
Stocks	5	0.0 %	2	58
Assets transit account	401	0.5 %	361	343
Collectibles	4 313	5.3 %	2 062	530
Prepayments	608	0.7 %	302	184
Cash in bank and on hand	766	0.9 %	2 564	406
Total (currents assets)	72 825	88.8 %	46 037	15 455
D) Total assets (A+B+C)	81 990	100.0 %	47 085	16 422
E) Accounts payable				
falling due within one year	(5 363)	100.0 %	(2 732)	(861)
falling due after one year	-		(2 090)	(4 422)
Total (creditors)	(5 363)	100.0 %	(4 822)	(5 283)
Net Assets or Accumulated Fund (D+E)	76 627		42 263	11 139

Table 7 Detailed investments as at end of fiscal year, 2002-2004, in millions of leones

	31 December 2004	31 December 2003	31 December 2002
Short term investments			
T-Bonds	16 710	13 373	195
T-Bills	47 031	27 356	13 736
Calls deposits government pensions	990		
Calls deposits	2 000	16	3
Total, short-term-investments	66 731	40 746	13 934
Long-term investments			
Land	597		
Sierra blocks concrete products limited	6 590		
Debenture Sierra Block project			
Barock project shares			
Total-long term investments	7 187	-	-

Table 8 Investment income during fiscal year, short term investments, by vehicle, 2002 - 2004

	2004	2003	2002
T-Bonds	2 434	838	
T-Bills	8 860	3 283	
Call deposits	35	-	
Total	11 329	4 121	-

Table 9 Rate of return* on assets, fiscal year, short term investment, by vehicle, 2002 - 2004

	2004	2003	2002
T-Bonds	18 %	13 %	
T-Bills	27 %	17 %	
Call deposits	4 %	5 %	
Total	22 %	16 %	

* Calculated according to the following formula:
Interest rate = (2*investment income)/(investment at beginning + investment at end – investment income)

Table 10 Historical annual rate of return of the fund, 2002-2004, in millions of leones

	2004	2003	2002
Initial reserve	42 263	11 116	0
Annual income	45 365	34 452	12 807
Annual outcome	11 002	3 304	1 691
Final reserve	76 627	42 263	11 116
Interest income	11 328	4 121	289
Interest rate*	21.1 %	16.7 %	5.3 %

* Estimated with the following formula:
interest rate = 2*(interest income)/(initial reserve + final reserve – interest income)
This formula assumes that all cash flows are uniformly distributed during the year. If income is cashed in later in the year, the formula may generate a lower annual interest rate than the real one.

Since 2004, a new portfolio has been developed, and is called Long-Term Investment. This portfolio represented 9.4 % of total investments as at 31 December 2004 and is expected to increase in the future according to the investment policy. For years 2003 and 2004, overall return of the fund was good, especially when compared to the estimation of the rate of increase in the average salary of the scheme which was about 12.3 %. In fact, for this period, the fund obtained an average real return around 6.5 %, which is favourably comparable to the target real interest rate on investment of 2 % used in the previous actuarial valuation. Also, there is some indication that the nominal rate of interest of the fund for 2005 will be around 21 %.

1.5.2 Description of the investment policy

The Investment Policy Statement emphasizes the need to maximize return on investments for a "steady state financing under the current contribution regime". Strategic objectives of investments are established. They focus on three elements:

- Maximize real value of the trust's assets and provide current income consistent with capital preservation and appreciation, as well as maintenance of liquidity;
- Minimize costs and risks associated with investments;
- Contribute to economic and social development of the country.

The asset mix focus on short-term liquidity, ensure long-term capital appreciation and minimize risk. The Board uses a strategy based on three axes:

- Achieve a rate of return that helps reaching needs;

- Mitigate the existing market risk;
- Serve critical and economic needs.

The investment policy recognizes the presence of significant information inefficiency in domestic market and high transaction costs. The Board of Trustees will determine the asset mix accordingly. In the mid-term, the Trust will be overweighted in potentially high-risk investments with higher long-term returns, leading to the following mid-term asset mix.

Table 11 Mid-term asset mix

Asset type	Proportion, in %	Margin (+/-), in %
Cash	5	2
Fixed Income	20	5
Equities	40	5
Property	35	5

Fixed income securities include T-bills, T-bonds, corporate and other government bonds, of several maturities. Foreign bonds are not described as possible securities.

Equity participation is essentially private in nature, as there is no stock exchange in Sierra Leone, and both joint venture and direct investment are allowed, both in new or existing corporations. Before going to direct investment, an investment must have proven and potential viable projects. Direct venture capital is allowed for investment with high capital needs, knowledgeable promoters, high expected financial return, ease of exit and presence of free cash flows. Indirect venture capital is limited to small and mid-size enterprises. Limit in a single stock is 60 % of the total share value of that stock and 10 % of the NASSIT total assets. For investment in existing companies, several requirements must be met, for example, profits and dividends must exist for the last three years. Requirements exist for new companies, but are different in their scope.

Property investment (or real estate) focuses primarily on real return assets. Direct investment is made in the Office Tower Block, shopping centers and parking lots.

Asset selection by the Board is guided by three principles: safety of the investment, yield required, and harmony with public interest. Furthermore, before investing in a specific equity, the potential growth of the investment, its contribution to economic growth and development and its potential tradability / liquidity are analyzed.

A detailed risk analysis mechanism is provided in the Statement. The first step consists in assessing an acceptable risk limit for Long term management of the NASSIT funds. A risk higher than the approved limit is accepted only if expected return is high enough to justify this breach to the rule. Bending the rule is also allowed if such a behavior is absolutely necessary to meet other criteria. Optimal diversification of the portfolio is also guided by the duration of assets and liabilities.

Seven types of risks are analyzed and assessed for each asset category: liquidity, currency, rate of return, business, financial, agency and operational. Benchmarking is also used as an analysis tool. The investment policy benchmark uses the actuarial report among others. Policy is determined by the Board, taking into account allocation profile, expected return on each investment and relative

weights of various assets and is reassessed annually based on long-term assets and liabilities assumptions, socio-economic considerations and an annual strategic review of the investment process. The Fund carries on its balance sheet the fair market value based on the Trust's external audit.

Finally, the Fund's governance principles require annual disclosure of several elements.

1.5.3 Comments on investment policy

The NASSIT set up a very well designed investment policy. This is not frequent in developing countries and indicates accurate knowledge of the environment in which a public pension scheme evolves. One must emphasize the detailed risk analysis structure which indicates the awareness of the Board regarding the risks that are faced by the fund. Also, the presence of refined investment brackets including margins for deviation and strategic objectives for investments, indicates a very well designed policy. The following comments concern the investment policy.

A) Investment criteria

In its "Criteria for the NASSIT Equity Participation in Corporate Investments", the NASSIT requires that investment in direct venture capital will be "guided by the potential ease of exit and free cash flows from the operations of the company", and "where expected financial returns from the investment are significantly high". For the time being, investments in stocks do not generate free cash flows and their book value did not change in the financial statements during the first six months of 2005. This issue may bring some concerns if a zero return appears for Sierra Concrete investment for several years and if real market value of the investment is not known.

Questions may also be raised regarding limits imposed in one stock. For the time being, a limit of 10 % of the NASSIT assets in one stock may not seem very significant. As cash flows are going to be positive for the next years, an investment of 10 % of current assets does not represent a large amount. However, over the years, 10 % will represent a tremendous amount. Such a limit could be revaluated downward. Also, the 60 % limit of one company's stock can raise questions concerning the risk of concentration.

A reference in the investment policy should be made concerning the scheme's cash-flows. When contributions are higher than expenditures, and this situation is expected to last for a long period, a long-term investment strategy could be adopted. During such a period, the portfolio could include a greater proportion of low-liquidity investments, that is, investments with low realized earnings but a high potential for increases in appraisal value. As shown in Table 35 cash-flows will become negative in 2029. It is important to review the portfolio frequently.

B) Board responsibilities

Responsibilities for investment decisions are distributed among three different entities:

- The Board of Trustees, which has the ultimate decision regarding investment.
- Management, which carries out analysis of proposals for the Trust's decision
- The Investment Committee, which advises the Board of Trustee on risk-return relationships for all proposals received by Management.

To these three entities is added the Investment Department of Management, which is responsible for the organization and day-to-day management of the investment process.

While this distribution of tasks may be appropriate over the short term, while the Fund remains fairly small, there should be considerations to create an independent board which would assume all investment tasks. This Board's sole goal would be to generate the highest possible return for an appropriate level of risk. Eventually, other public institutions may chose to invest through that Board, generating economies of scale.

C) Investing locally or abroad

The investment strategy identified five axes for development, and techniques for investing in housing, real estate, and financial and corporate investments. Over the long term, these targets are probably interesting to consider, but they require the building of infrastructures and the constitution of a financially adequate environment. There should be consideration regarding other investments such as international bonds, stocks or indexes keeping in mind a macro-economic equilibrium. While the size of this investment does not need to be large, there should be room for the investment department to go abroad for the following reasons:

- To prevent the danger of having control over too much of the total amount of investment equity in Sierra Leone.
- To provide some relief to the local economy which may not be able to create enough wealth to absorb all these savings due to the lack of available private equity investments.
- To recognize the need for risk diversification.
- To prevent situations where too strong a willingness to invest locally may simply lead to a substitution of responsibilities regarding the overall population from the government towards the public scheme. Also, the public scheme must not be viewed as a spillway for Sierra Leone government bonds. This could happen if the local capital market is not sufficient for the size of the fund.

Stakeholders must understand the goal of this type of investments. Investing abroad should not be understood as a lack of confidence in Sierra Leone's economy. It is simply a risk management control that is used by most countries. In any case, a strong external and internal audit will be required to ensure that these funds are not diverted.

Therefore, limits on international investments could be stated clearly (including investments in derivatives), as is already being done for investments in a single company (60 %) and for the proportion of the total NASSIT portfolio in one stock (10 %). For example, bonds issued by the African Development Bank (for example) may provide interesting cash-flow in strong currencies, and at the same time maintain a regional perspective of investments.

D) Human resources

Human resources are sometimes a handicap when building a portfolio. Lack of an adequate knowledge of investment tools and securities has been highlighted as a significant limit in applying an investment policy. We encourage the NASSIT to invest in the continuing education of its resources who work on the investment field.

1.6 Financial system and evaluation of the reserve (fund)

The social security code stipulates that contribution rates must be fixed so that the total income makes it possible to cover the technical expenses as well as the part of the administrative costs. Also, a specified amount of reserve should be constituted. However there are different factors that will affect the achievement of this goal:

- The natural increase in the level of expenditures over a long period (especially for a young scheme like the NASSIT).
- The desire to have a stable contribution rate (making it more likely that employees and employers will remain confident in the scheme) and to have a contribution rate that will not become a burden on the people who contribute to the scheme.
- The duration of the equilibrium period and the amount (level) of reserve that must be attained throughout this period.

A partial funding system has been retained for the financing of the NASSIT, as is generally the case for a new scheme. It was suggested in the inception report that a period exceeding 20 years should be chosen as the equilibrium period which guarantees the stability of the contribution rate. Over this period contributions must be enough to pay all benefits and costs and constitute a reserve at least equal to three times the total expenditure in the previous year.

What is important to understand with this type of financing is that, at the end of the equilibrium period, if the contribution rate has not been increased throughout this period, the increase in the contribution rate to meet the objectives in the second equilibrium period could be very high. To avoid this situation, it is often proposed to gradually raise the rates during the equilibrium period (See section 3.1.3 for an example of this situation).

We also suggest that the objectives regarding the equilibrium period and the minimum level of reserve that have to be maintained be included in the regulations concerning the NASSIT. This will help establish a common and stable objective for everyone and avoid situations where these objectives could change from one actuarial valuation to another. We suggest an equilibrium period of 20 years and an ultimate reserve that will be equal to three times the total expenditure in the previous year.

1.7 Analysis of the experience of the scheme since its inception

To understand the direction the scheme could take in the future, it is important to understand the past experience. To do this, we compare the real experience of the scheme with what was expected in the inception report. In such a comparison, it is not important to put emphasis on absolute numbers. It is the relation between income and expenditures that gives meaning to our analysis. Also, it is more important to compare the similar durations since the inception of the scheme than any particular years. The following tables summarize the expected experience (Table 12) and the real experience for the years 2002, 2003 and 2004 (Table 13). We add to these years, what is expected in the budget for the years 2005, 2006 and 2007.

Table 12 Expected experience of the scheme in the inception actuarial report

	Income			Expenditures			Ratio
Year	Contrib.	Investment	Total	Benefits	Adm.	Total	Exp./income
T=1 (2002)	9 352	605	9 957	135	1 146	1 281	12.9 %
T=2 (2003)	12 373	1 940	14 313	482	1 524	2 006	14.0 %
T=3 (2004)	15 651	3 559	19 210	927	1 936	2 863	14.9 %
T=4 (2005)	18 674	5 365	24 039	1 601	2 320	3 921	16.3 %
T=5(2006)	21 327	7 871	29 198	2 385	2 661	5 046	17.3 %
T=6(2007)	23 878	10 836	34 714	3 501	2 981	6 482	18.7 %

In private and parastatal sector, contribution rate = 5 %. For public sector contribution rate = 14.5 %
Source : Report on the design and financing of the National social insurance trust Fund, Table 28

Table 13 Real experience of the scheme and budget of income and expenditures for year 2005 to 2007

	Income			Expenditures			Ratio
Year	Contrib	Investment	Total	Benefits	Adm	Total	Exp. /Income
T=1 (2002)	12 505	289	12 794		1 691	1 691	13.2 %
T=2 (2003)	30 327	4 121	34 448	54	3 250	3 304	9.6 %
T=3 (2004)	28 891	11 328	40 219	311	6 407	6 718	16.7 %
T=4 (2005)	43 778	15 539	59 317	634	12 359	12 993	21.9 %
T=5(2006)	49 613	19 352	68 965	1 360	11 063	12 423	18.0 %
T=6(2007)	56 146	25 157	81 303	2 869	10 690	13 559	16.7 %

Contributions = 15 % for all members + 2.5 % for public sector members (since May 2004)
Sources : 2002, 2003, and 2004 : financial statements / 2005, 2006 and 2007 : Budget of income and expenditures for 2005 and 2007

Our comparison tells us that the real experience (2002 to 2004) is in line with the expected experience. The expected average ratio of expenditure to income for the first 3 years was 13.9 %. In reality, the ratio was 13.2 %. During the next three years, in the inception actuarial report, it was expected that this ratio would equal 17.4 %. In the budget for the year 2005 to 2007, the expected ratio is 18.9 %, which is slightly higher than 17.4 %. Even if for each period of three years, the ratios are close, there are some elements that must be taken into account that will darken the picture.

- The real picture does not take into account the actual number of years of credited service for the participants in the public sector. Taking these years into account will increase expenditures.
- The ratio of the administrative costs to the contributions in the inception report for the first 6 years is 12.4 % while it is expected that this ratio will be in reality 20.5 %.
- In the inception report, the contribution rate for the private sector is 5 % while it is 15 % in reality.

The first two points put more pressure on the scheme than was expected. The last point tells us that, even if we were to triple the contribution rate for people in the private sector, the complete picture of the scheme would not be better than what would have been expected without such an important difference in the rates.

1.8 Conformity of the NASSIT with Convention 102

In 1952, the ILO adopted the Convention 102 which establishes a frame for social security. As of 2005, 41 countries ratified this convention. Sierra Leone has not ratified it yet. Term of reference of this actuarial review asked for an evaluation of the conformity of the NASSIT with this convention.

Four components are analysed for compliance with Convention 102: eligibility, flexibility, benefit calculation, transitional rules. The next tables present a summary of the compliance of the NASSIT to ILO requirements, for each benefit and for each component.

ILO Convention 102 establishes two main patterns of schemes, a first one which cover all cases, and a second one which applies to schemes "where, in principles, all economically actives people areprotected". As, in theory, the Sierra Leone public pension scheme covers all active people through the voluntary coverage of the self-employed, we used the more stringent package of provisions (i.e. coverage of the total active population) in order to assess compliance to Convention 102. This assessment represents the comprehension of the authors regarding the application of the Convention. The application of the less stringent package (i.e. coverage of only a part of the active population) would lead to a more complete compliance with the Convention. We invite the NASSIT to request a validation of the conformity of the provisions of the scheme to the Convention 102 directly with ILO. That would avoid the questions of interpretation which the authors had to face and would give a clearer picture of the compliance to Convention 102.

Table 14a) Meeting Convention 102 criteria : Eligibility

Benefit	Eligibility		
	Convention 102	NASSIT	Comply
Retirement pension	30 YOC*/ 20 YOR or defined contributory period *[29.1a, b]*	180 MOC	Yes
Invalidity pension	Paid if at least total and permanent disability; At least if 15 YOC/ 10 YOR or (3 YOC and defined contributory period) *[57.1a,b]*	60 MOC including 12 MOC among last 36 MOC, or 180 MOC.	Yes
Survivor pension	If at least if 15 YOC/ 10 YOR or (3 YOC and defined contributory period) *[63.1 a,b]*	60 MOC including 12 MOC among last 36 MOC	In general[1] *
Annual adjustment	Irrelevant		

1 ILO does not consider necessary to have contributions in the years preceding death, under both patterns.
* Would be complying under the less stringent package

Table 14b) Meeting Convention 102 criteria : Partial pension

Benefit	Flexibility for partial pension		
	Convention 102	NASSIT	Comply
Retirement pension	15 YOC or 50 % of contributory period *[29.2a;b]*	Basic requirement meets flexibility rules	Yes
Invalidity pension	If 5 YOC or (3 YOC and 50 % of contributory period) *[57.2a;b]*	If do not meet requirement, a grant is paid	Partly[2 *]
Survivor pension	If 5 YOC or (3 YOC and 50 % of contributory period) *[63.2a;b]*	If do not meet requirement, a grant is paid	Partly[3 *]
Annual adjustment		Irrelevant	

2 ILO considers that partial pension should be paid when regular pension requirements are not met. To have a fix amount paid represents a first step, but is not enough.

3 ILO considers that partial pension should be paid when regular pension requirements are not met. To have a fix amount paid represents a first step, but is not enough.

* Would not comply under the less stringent package

Table 14c) Meeting Convention 102 criteria : Benefit amount

Benefit	Amount		
	Convention 102	NASSIT	Comply
Retirement pension	40 % of salary of average worker, payable for life *[28, 29, 30, 65 ,Schedule XI]*	30 % after 180 MOC + 2 % per 12 MOC afterwards.	In general[4 *]
Invalidity pension	40 % of salary of average worker *[56, 57.3, 57.4, 65, Schedule XI]*	30 % after 180 MOC + 2 % per 12 MOC afterwards.	In general[5 **]
Survivor pension	40 % of salary of average worker *[62a, 63, 65, Schedule XI]*	40 % of the member's pension for the spouse and 60 % for the child (the contribution period is increased by 6 months for each year between the death and the age 60).	In general[6***]
Annual adjustment	following substantial changes in the general level of earnings where these result from substantial changes in the cost of living. *[65.10]*	Triennial adjustment in line with wage of members, triggered when increase higher than 5 % over three years. Indexation = 80 % of increase[7].	Yes

4 The pension is payable after 15 YOC only, while Convention 102 requires the payment of a pension after a contribution period of 50 % of the overall contributory period.

5 The pension is payable after 15 YOC, while Convention 102 requires payment of a pension after a shorter period.

6 The pension is payable after 15 YOC, while Convention 102 requires payment of a pension after a shorter period.

7 According to a proposed policy

* Compliance would be reached under the less stringent package

** Would not comply under the less stringent package, for the same reason as in point 5.

*** Would not comply under the less stringent package, for the same reason as in point 6.

Table 14d) Meeting Convention 102 criteria : Transition ules

Benefit	Transition rule		
	Convention 102	NASSIT	Comply
Retirement pension	pension should be guaranteed when a minimum contribution period is required for those which, due to age, cannot reach that minimum contribution period. *[29.5]*	people aged above 55 who are not meeting the minimum number of months of the qualifying period are entitled to make up the shortfall by purchasing additional earned credits. Past service before inception of the scheme may be recognized for some groups.	No[8]
Invalidity pension		irrelevant	
Survivor pension		irrelevant	
Annual adjustment		irrelevant	

8 As elderly may not, during the first years of the existence of the scheme, be entitled to a pension otherwise than under a voluntary basis, it appears that a pension, even partial, is not guaranteed for those who cannot reach 15 YOC before attainement of 65.

*YOR : Years of Residence
YOC : Years of Contribution
MOC : Months of contribution

The following comments present the main conclusions to observe from the previous tables.

1. Eligibility to retirement and invalidity pension match the requirements, but survivors' pension do not match convention because this pension should be payable after 36 months of contribution when a period of contribution is defined, but NASSIT requires 60 months of contribution.

2. Flexibility parameters hardly meet Convention 102 requirements, mainly because no reduced pension is available for people who match only partly eligibility requirements for invalidity and survivor benefits. However, grants are paid by the NASSIT in replacement of partial pension.

3. Regarding benefit amounts, both retirement and survivor pensions match Convention 102 requirements. However, for invalidity pensioners who just have between 180 MOC and 240 MOC, benefits may be smaller than 40 % of average income. Annual adjustment rules are slightly more restrictive than what is required by the Convention.

4. Transition rules after inception of the scheme do not meet ILO requirements. Those who are older than 45 years-old upon inception of the scheme will not be able to receive a pension if their past service is not recognized. Even though such recognition is under way, the problem is that this process does not apply for all employees.

While the NASSIT exceeds Convention 102 of the ILO requirements for most items, it may lags behind under several situations. The most obvious point remains transition rules which requires further consideration.

1.9 Introduction of new benefits

The terms of reference for this actuarial report requires an analysis of the feasibility of introducing a short-term benefits plan and the conditions necessary to put in place social security benefits designed especially for self-employed workers. After discussions on these topics, we conclude that it is too early to develop such additional benefits. We suggest that the NASSIT concentrate its efforts on consolidating the new scheme and on ensuring that the startup process is well engaged. (The startup process for a new social security scheme lasts more that three years).

2 Projection framework

The projection of the financial results of the NASSIT requires statistical information on the initial insured population and on pensions being paid as at the valuation date, and a set of actuarial assumptions. Then initial covered population is broken down into nine different groups, each being under a different set of demographic and parametric assumptions, but with similar economic scenarios. The selection of the assumptions takes into account the recent experience of Sierra Leone (where information is available). However, these assumptions are also selected to reflect long-term trends rather than to put too much emphasis on recent results.

The nine groups are defined as follow: civil servants, teachers, police, and employees from the private sector, and participants are broken down by sex. For military personnel, all participants are considered as males.

The actuarial valuation also requires reproducing in the projection model the legal provisions of the scheme. An overview of the legal provisions of the scheme administered by the NASSIT is presented in Appendix 1.

2.1 Data gathering

The data needed for the actuarial valuation regarding participants normally originate from the Area offices. The Head office periodically updates the data gathered by the Area offices. Furthermore, after consolidation, the head office provides Area offices with consolidated data, allowing each of them to get a complete picture of the overall scheme.

Area offices are responsible for the following:

- Payments;
- Collection of contributions;
- Inspections;
- Participant registration.

Head office is responsible for the following:

- Benefits calculations;
- Consolidation of all data received from Area offices.

There are essentially two systems for administering the pensions at the NASSIT. The first is for the administration of former civil servants whose benefits were already being paid as at the date of inception of the plan and the other for the actual participants. The second system is named NAPOS. At the moment of the actuarial valuation, no pension calculations had been made by NAPOS.

Collection of the data required to perform the actuarial valuation was jointly carried out by the NASSIT and by the author of this report. The sources of data are the following:

- The NASSIT transmitted to the author a text file containing all the necessary data on the participants at registration (registration number, sex, date of birth, information on spouse

and children, salary at registration). The author used SAS software to merge and analyze the data.

- For participants in the private sector, the NASSIT transmitted to the author a text file permitting reconstitution of annual salaries for 2002, 2003 and 2004. About 40 % of all participants in the private sector were included in this file.
- The payroll entity of the government transmitted Excel files containing the monthly salaries of participants and other files that contained specific information on participants (sex and date of birth). Again SAS software was used to merge together all these files. It was not possible to link the data transmitted by the government with the NAPOS system.
- As mentioned previously, complete data concerning the length of past credited service of participants from the public sector were not available. In 2005, the NASSIT has undertaken an exercise to validate past service for all participants working in the public sector. During our visit to Freetown, nearly 5 000 validations approved by government were transmitted to the NASSIT. People from the NASSIT put together in an Excel file the date of birth and length of service of about 4 600 participants to help us to make assumptions concerning past service of public sector participants. The sample contains information on about 2 000 military personnel and police and 2 600 civil servants. No information concerning teachers was available. We make the assumption that the length of service of teachers is the same as that of civil servants.

We don't have a complete picture of all the participants to perform the actuarial valuation. However, we believe that the information we have constitutes a good sample that will give us a good approximation of reality. Also, we have done cross checking with financial statements to be sure that the data used for the actuarial valuation are coherent. We encourage the NASSIT to continue its effort to input all information needed for an actuarial valuation on the NAPOS system for all active participants in private and public sectors and all beneficiaries.

Table 15 shows the number (sample) of participants that was used to determine the age and sex distribution and salary distribution of the active population. To obtain a good picture, we have also eliminated data that were incomplete (for example, the sex or the age was not available). These numbers are compared with the actual population of active participants for each category (proportion).

Table 15 Samples used to determine the distribution of the initial population, 2004

	Number of participants in the sample	Total numbers of participants	Proportion
Civil servants	12 120	16 077	75.4 %
Teachers	23 743	25 300	93.8 %
Police	7 514	7 673	97.9 %
Military personnel	11 646	14 366	81.1 %
Private sector and Subsidized institutions	15 378	37 437	41.1 %
Total	70 401	100 853	69.8 %

2.2 Insured population

The projection of insured population requires a certain amount of information and a number of assumptions. Projections start with an estimate of the insured population as at date of analysis. The growth of this population is then estimated using the assumptions described in section 2.2.2. Several other decrement assumptions are required, namely, retirement rates by age and sex, prevalence rate of disability and mortality rates among disabled persons. Finally, a distribution assumption is required for new entrants in the covered population.

2.2.1 Insured population as of the valuation date

Data on the insured population were obtained from the NASSIT. Table 16 a) through Table 16 d) show insured population as at the valuation date, by age and sex, and by covered group.

Table 16a) Distribution of civilian employees by age and sex, 30 June 2004

Age	Males	Females	Total
15 - 19	16	7	23
20 - 24	16	5	22
25 - 29	74	104	178
30 - 34	412	378	791
35 - 39	1 084	729	1 814
40 - 44	2 114	1 003	3 117
45 - 49	3 154	1 041	4 194
50 - 54	2 867	672	3 539
55 - 59	1 983	417	2 400
60 - 64	0	0	0
65 - 69	0	0	0
Total	11 721	4 356	16 077

Table 16b) Distribution of police and military personnel by age and sex, 30 June 2004

Age	Males Police	Females Police	Total Police	Total Military personnel
15 - 19	6	1	7	4
20 - 24	295	78	374	1 067
25 - 29	1 048	270	1 318	4 084
30 - 34	1 050	170	1 220	4 150
35 - 39	1 319	113	1 432	2 516
40 - 44	1 406	123	1 529	1 317
45 - 49	869	81	951	675
50 - 54	634	41	674	501
55 - 59	164	3	167	52
60 - 64	0	0	0	0
65 - 69	0	0	0	0
Total	6 792	881	7 673	14 366

Table 16c) Distribution in the private sector employees by age and sex, 30 June 2004

Age	Males	Females	Total
15 - 19	83	8	91
20 - 24	1 512	590	2 102
25 - 29	4 255	1 839	6 094
30 - 34	5 877	1 514	7 391
35 - 39	5 296	1 396	6 692
40 - 44	4 826	1 048	5 874
45 - 49	3 551	870	4 420
50 - 54	2 740	491	3 230
55 - 59	1 980	210	2 191
60 - 64	0	0	0
65 - 69	0	0	0
Total	30 119	7 318	37 437

Table 16d) Distribution of teachers by age and sex, 30 June 2004

Age	Males	Females	Total
15 - 19	22	9	31
20 - 24	168	89	257
25 - 29	1 544	790	2 333
30 - 34	3 061	1 227	4 287
35 - 39	3 633	1 185	4 818
40 - 44	4 238	1 070	5 308
45 - 49	3 450	731	4 181
50 - 54	2 200	361	2 561
55 - 59	1 256	268	1 524
60 - 64	0	0	0
65 - 69	0	0	0
Total	19 571	5 729	25 300

2.2.2 Projection of the insured population

The projection of the insured population constitutes the basis for projections of the scheme's costs. Generally, these projections require the use of assumptions pertaining specifically to the population, such as retirement rate by age and sex.

The insured population was projected by applying an annual growth rate to the initial insured population by group.[6] Once total growth is established, the number of new entrants in the covered population is calculated by adding to this growth the number of people who become disabled or who retired. Retirement rates, disability rates and distribution of new entrants are all estimated by age, sex and group.

[6] See section 2.2.2.1

2.2.2.1 Growth of insured population

In order to realize the forecast of the NASSIT social security system costs, the initial insured population has to be projected over the long term. In order to do so, an annual growth rate has been used, which is different for each subgroup of the insured population. The following table presents these annual growth rates. The growth of the insured population reflects long-term trends and also includes a provision for improvement in coverage and compliance. Over the short term, the growth of the insured population has been chosen to match recent experience and to recognize the growth that is anticipated in the 2005-2007 budget. Growth rates also follow the anticipated workers reduction policy of the government. For example, the government is determined to reduce the number of militaries to 11 000 in 2008.

Table 17 Population growth assumption by insured sector, sex and period

	2005	2006	2007	2008	2009	2010 +
Civil servants						
Males	-4.2 %	0.2 %	0.4 %	0.6 %	0.8 %	1.0 %
Females	-4.2 %	0.3 %	0.6 %	0.9 %	1.2 %	1.5 %
Teachers						
Males	-1.2 %	0.2 %	0.4 %	0.6 %	0.8 %	1.0 %
Females	-1.2 %	0.3 %	0.6 %	0.9 %	1.2 %	1.5 %

	2005	2006 +
Police		
Males	8.4 %	1.0 %
Females	8.9 %	1.5 %

	2005	2006	2007	2008	2009	2010 +
Military personnel	- 7.8 %	-5.1 %	-5.3 %	- 5.6 %	0.0 %	0.0 %

	2005	2006	2010	2020	2030	2033 +
Private						
Males	6.6 %	6.4 %	5.6 %	3.6 %	1.6 %	1.0 %
Females	7.1 %	6.9 %	6.1 %	4.1 %	2.1 %	1.5 %

2.2.2.2 Distribution of new entrants

This distribution is established from the experience of the scheme. The same distribution of new entrants is applied to each group, regardless of sex. According to the model used, the number of new entrants is the difference between the population at the beginning of the year, to which an overall growth rate is applied, and the same population at beginning of the year to which mortality and retirement rates are applied. Table 18 presents the distribution of new entrants.

Table 18 Distribution of new entrants

Age	Males	Females
15-19	**1 %**	**1 %**
20-24	**19 %**	**21 %**
25-29	**30 %**	**36 %**
30-34	**20 %**	**20 %**
35-39	**15 %**	**11 %**
40-44	**12 %**	**7 %**
45-49	**3 %**	**4 %**
50-54	**0 %**	**0 %**
55 et +	**0 %**	**0 %**
Total	**100 %**	**100 %**

2.2.2.3 Mortality rates

Death rates per age used for projections come from standardized mortality tables used by the United Nations. The assumption of additional mortality due to AIDS is included implicitly in these projections. The initial mortality rates used for this actuarial valuation are the same as the ones used in the previous actuarial valuation and have been adjusted to reproduce the life expectancy obtained in the average scenario of the United Nations. Table 19 shows life expectancy at various ages for men and women. Life expectancy in 2004 was established at 39.7 years for men and 42.4 years for women. This life expectancy is expected to increase during the period of projection and reach 58.1 years for men in 2054 and 62.9 years for women in the same year. The existence of a recent census in Sierra Leone could have allowed to use more precise mortality assumptions in the future. For this actuarial valuation, the results of that census were not available.

Table 19 Life expectancy at different periods of time, by age and sex

	Women			Men		
Year	At birth	At 30	At 60	At birth	At 30	At 60
2004	42.4	35.6	13.5	39.7	33.9	12.9
2029	51.4	38.8	14.9	47.6	36.4	13.9
2054	62.9	43.2	17.2	58.1	40.1	15.7

Mortality rates are assumed to decline continuously during the projection period in line with the assumed increase of the average life expectancy. This mortality pattern is also used to project survivors' benefits payable on a participant's death.

Table 20 Sample mortality rates, 2005 and 2054

	Males		Females	
Age	**2005**	**2054**	**2005**	**2054**
0	0.19534	0.09792	0.16683	0.08147
5	0.01214	0.00370	0.01185	0.00282
10	0.00351	0.00123	0.00339	0.00088
15	0.00307	0.00115	0.00345	0.00086
20	0.00386	0.00144	0.00516	0.00121
25	0.00458	0.00173	0.00604	0.00145
30	0.00549	0.00216	0.00621	0.00165
35	0.00701	0.00293	0.00654	0.00201
40	0.00947	0.00428	0.00768	0.00276
45	0.01317	0.00644	0.01011	0.00413
50	0.01858	0.00981	0.01430	0.00647
55	0.02628	0.01499	0.02093	0.01030
60	0.03714	0.02288	0.03099	0.01650
65	0.05229	0.03481	0.04596	0.02642
70	0.07318	0.05263	0.06780	0.04208
75	0.10151	0.07884	0.09903	0.06641
80	0.13919	0.11649	0.14249	0.10330
85	0.18792	0.16883	0.20079	0.15724
90	0.24879	0.23835	0.27531	0.23206
95	0.32156	0.32529	0.36486	0.32861
100	1.00000	1.00000	1.00000	1.00000

2.2.2.4 Age at retirement

The actuarial model used for the present actuarial review considers retirement as the residual element of a series of factors. The growth factor described in section 2.2.2.1 provides the number of people employed each year. For a given age (at which retirement is possible under the Social Security scheme), and once deaths are considered, the difference between the number of persons in two consecutive years is the number of new retirees. Consistency checks are performed to reproduce the retirement pattern observed under the scheme. For this analysis, the assumptions about age at retirement are:

- For civil servants and teachers, it is assumed that people retire between age 55 and 60 with an average age at retirement of 59;
- For police and military personnel, people should retire at age 55;
- For participants in the private sector (including subsidized institutions) it is expected that everyone retires at 60.

When a participant retires before age 60, his pension is reduced by a factor equal to 4 % for each year preceding the participant's 60th birthday. During our visit to Freetown, there was a discussion on the way the reduction factor for early retirement should be applied. There were two points of view for the application of the reduction factor:

- For example, for a participant who retires at age 55 with 30 years of services, the amount of pension according to the first point of view would be 40 % times the average salary. The 40 % is obtained by reducing the accumulation factor of 60 % by 20 %, which is a reduction of 4 % for the 5 years between age 55 and age 60 (40 % = 60 % - 20 %).

- According to the second point a view, the amount of pension is 48 % times the average salary. The 48 % is calculated by multiplying the accumulation factor (without reduction) of 60 % by 80 %, which represent a reduction of 4 % for the 5 years between age 55 and age 60.

In our opinion the second point of view is the one that should prevail for the application of the factor upon an early retirement. Our view is based on the following:

- The second point of view is more in line with the general practice for applying a reduction factor for early retirement;
- Section 29 of the regulation specifies that it is the full pension amount that is reduced by a factor of 4 % by year before age 60 and not the accumulation factor.

2.2.2.5 Disability incidence rates

The assumption concerning disability incidence rates used for this actuarial valuation is the same that the one used in the inception actuarial analysis. As the scheme will mature, more experience will emerge permitting adjustments in this assumption to reflect the real experience.

Table 21 Disability rates (Rates per 10 000 persons)

Age	Females	Males
15	0.3	0.1
20	1.6	0.8
25	4.1	2.6
30	7.8	5.4
35	12.4	9.1
40	16.0	12.4
45	20.9	16.6
50	33.8	27.1
55	66.7	49.1

2.2.2.6 Mortality rates among disabled persons

Disabled persons generally experience higher mortality than active participants. It was assumed that the mortality of disabled persons is five times that of active participants at age 15 and decreases linearly to equal that of the active participants at age 55. The multiplication factors used are shown in Table 22.

Table 22 Loading factor for mortality rates among disabled persons

Age	Factor
15 or less	5.0
20	4.5
25	4.0
30	3.5
35	3.0
40	2.5
45	2.0
50	1.5
55 and over	1.0

2.2.2.7 Structure of the insured population

The following figures show the age structure of the initial insured population by sex and the one that would prevail at the end of the projection period for both the private and the public sectors. At the beginning of the projection period, the number of insured people is 100 800 and the average age is 39 while at the end of the projection period there are 239 600 people insured with an average age of 42. Comparison of the two figures also shows the importance of the private sector in the future, in term of number of members.

Figure 1 Distribution of the insured population by age, sex and sector, as of 30 June 2004

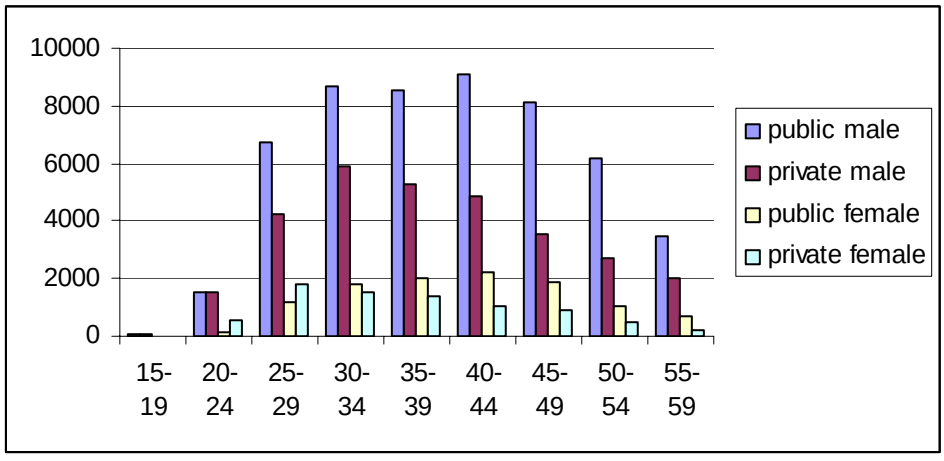
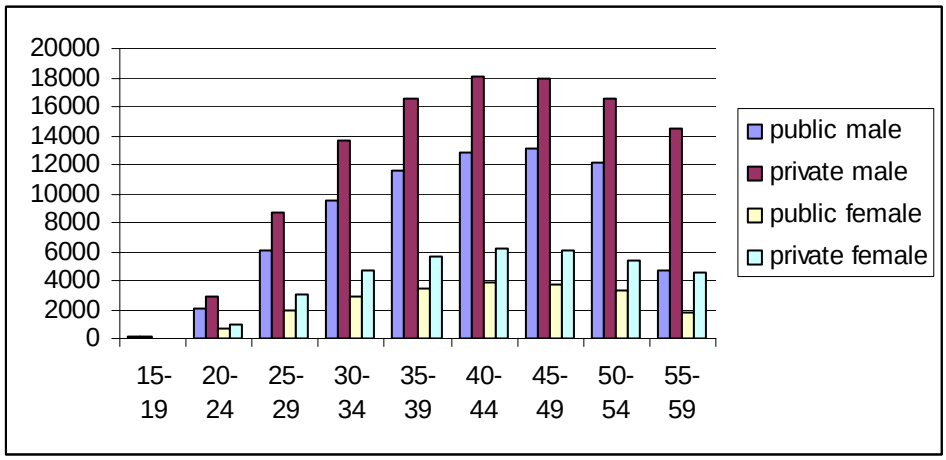


Figure 2 Distribution of the insured population by age, sex and sector, as of 30 June 2054



2.3 Economic assumptions

Financial evolution of the NASSIT pension scheme will be directly influenced by the economic development of Sierra Leone and by the evolution of the labor market. However, the NASSIT covers only a small part of the working population, and the country is subjected to numerous financial and economic constraints. For these reasons, the analysis of the macroeconomic framework is simplified. Inflation was directly established from the macroeconomic data of Sierra Leone. Rate of increase of salaries and interest rates were established as exogenous variables in this analysis.

2.3.1 Inflation

Table 23 shows the inflation rate in Sierra Leone since 1998. This information comes from data obtained by the Ministry of Finance. In the future, inflation is presumed to be 10 % in 2005, declining to 4 % in year 2010 and after. Inflation remains constant thereafter.

Table 23 Inflation rate, 1998-2004

Year	Inflation rate (%)
1998	35.5
1999	34.1
2000	-0.9
2001	2.2
2002	-3.3
2003	7.6
2004	14.2

2.3.2 Earnings increases and interest rates

Assumptions for salary growth and interest rates were established in an exogenous way. These assumptions represent the outcome of an economic framework observed frequently in other African countries. For the purposes of projection, in the long run, the real growth of salaries was established at 1 % annually and corresponds to a realistic long-term assumption. For 2005 and 2006, the global real salary growth is 6.0 % and 5.2 % respectively. However, a higher salary growth for private sector has been assumed, to reflect recent experience and to better fit contributions anticipated in the 2005-2007 budget. The global real salary growth will decrease to reach the ultimate level in 2018.

Interest rates for the first years of projection were derived from the rates observed during the last five years. For the first year of forecast, the interest rate is established at 18 %, decreasing to reach an ultimate rate of 7 % from the fourteenth year of projection. The ultimate real interest rate is consequently 3 % a year. Table 24 presents interest rates obtained on T-bills in Sierra Leone, between 1998 and 2004. As an indication of a the long term assumptions for interest rates, Table 25 presents nominal and real interest rates from which capital invested in bonds in western countries could benefit. The investment policy specifies the target for measuring the investment performance of the fund. In fact, the return of the fund must exceed by 2 % the increase in salary. For the present actuarial valuation we maintain the same target.

Table 24 Interest rates on T-bills, 1998-2003

Year	Interest rate (%)
1998	34.4
1999	34.7
2000	20.0
2001	14.7
2002	15.0
2003^{est}	20.2
2004^{est}	28.0

Table 25 Nominal and real interest rates on bonds with maturity of 10 years, various countries, 2005

Countries	Nominal interest rate bonds 10 years (%)	Inflation* (%)	Real rates (%)
Canada	4.05	2.20	1.85
United-states	4.29	3.40	0.89
EEC	3.38	2.20	1.18
Germany	3.38	2.00	1.38
France	3.40	1.80	1.60
United Kingdom	4.41	2.10	3.31
Switzerland	2.04	1.20	0.84
Japan	1.37	-0.30	1.67
Australia	5.34	2.60	2.74

*Source: Québec Ministère des Finances, international economic statistics, 23 January 2006.

Table 26 summarizes economic assumptions used in the basic scenario.

Table 26 Inflation rates, earnings growth and return on the fund, 2005-2009, as a percentage

Period	Inflation rates	Average rate of growth on earnings		Annual interest rate	
		Real	Nominal	Real*	Nominal
2005	0.100	0.060	0.160	0.020	0.180
2006	0.088	0.052	0.140	0.020	0.160
2007	0.076	0.044	0.120	0.020	0.140
2008	0.064	0.036	0.100	0.020	0.120
2009	0.052	0.028	0.080	0.020	0.100
2014	0.040	0.023	0.063	0.020	0.083
Ultimate (2018)	0.040	0.010	0.050	0.020	0.070

* The real rate of interest for the table 26 is the difference between nominal rate of interest and nominal average rate of growth on earnings.

2.4 Parametric assumptions and data

Social security schemes and the insured population present other characteristics which must be reflected in the valuation. These parameters are neither considered economic (like inflation or interest rates) nor demographic (like mortality rates). They are grouped in a class of assumptions and data called “parametric”.

2.4.1 Salary scale and density of contribution

The data on the average salary of participants (according to age and sex) were obtained from a retrieval from the NASSIT database for the private sector and from data transmitted by the government’s payroll entity for the public sector. The following tables show the salary scale used at the beginning of the projection period. Earnings are projected using assumptions presented in the previous section.

For purposes of projection, the actuarial model distributes average wages in three sections (low, medium, high) with an aim of measuring the effect of the minimum pension and the ceiling if applicable. Moreover, it is estimated that the dispersion observed in the distribution of the earnings will remain constant during the period of projection.

For the public sector, the earnings were established by considering that one year of the total earnings for an employee were paid out uniformly during the year. This means that the participants will accumulate pension benefits quickly and that the proportion of those who will be entitled to a pension, will increase, to the detriment of those entitled only to a grant benefit. Furthermore, by doing so, the density of contribution, which represents the proportion of the year during which the participants pay contributions to the scheme, is automatically equal to 100 percent. However, for the private sector, we assumed a density of contribution equal to 75 percent, reflecting less stability in employment.

Table 27 Distribution of earnings by age and sex, by group, 2004, in leones ('000)

	Civil servants		Military personnel	Private sector	
Age	**Males**	**Females**		**Males**	**Females**
15-19	788	788	756	1 334	1 681
20-24	788	788	756	1 354	1 666
25-29	946	946	848	2 083	2 550
30-34	1 025	1 025	968	2 635	3 110
35-39	1 064	1 064	1 076	3 063	3 714
40-44	1 104	1 104	1 168	3 295	4 165
45-49	1 183	1 183	1 672	3 675	4 273
50-54	1 262	1 262	1 876	4 538	6 873
55 et +	1 419	1 419	3 391	4 762	6 751
Average	1 209	1 159	1 029	3 388	3 106

Table 28 Distribution of earnings by age and sex, by group, 2004, in leones ('000)

	Teachers		Police	
Age	**Males**	**Females**	**Males**	**Females**
15-19	738	845	666	652
20-24	738	845	666	652
25-29	1 048	1 092	775	683
30-34	1 316	1 328	911	833
35-39	1 446	1 476	1 084	1 021
40-44	1 616	1 687	1 181	1 211
45-49	2 096	2 179	1 318	1 368
50-54	2 624	2 560	1 478	1 579
55 et +	2 980	2 935	1 478	1 579
Average	1 770	1 646	1 087	934

2.4.2 Past service

Credited service for the active and inactive insured populations was obtained from a survey of the validation forms sent to the NASSIT. Average data are presented in Table 29. For each age and sex group, the average number of contribution years has been distributed over a range of possible values (using a normal distribution) in order to better reflect the effect of eligibility conditions on the number of emerging pensions and grants.

Table 29 Average past contribution years for active insured persons, as at 31 December 2004

Age	Males and females Private sector	Military personnel	Males and females Public sector
20	2.1	0.7	3.9
25	2.2	4.1	7.6
30	2.2	8.4	11.3
35	2.3	12.7	15.0
40	2.4	17.0	18.7
45	2.4	21.3	22.4
50	2.5	25.6	26.1
55	2.6	29.9	29.8
60	2.6	34.3	33.4

2.4.3 Pensioners as of the valuation date

There are no pensioners as of the valuation date. Only grant benefits have been paid since the inception of the scheme. However, as discussed in the section 1.3.2, we will assume in this actuarial valuation that all benefits have been and will be calculated using the real past contribution years for each participants. Our first goal is not to replicate what really will happen in the next years for the NASSIT. It is rather to measure the adequacy of the contributions rate and the viability of the scheme. We are aware that, at the beginning of a public pension scheme, there is a lot of backlog in the payments process of benefits, that participants and beneficiaries are not fully knowledgeable about their rights and that, like the case of the NASSIT, there are some adjustments that must be made to benefits already paid. Taking all those things into account distract us from our main goal, which is to verify the scheme's viability. Appendix 3 shows the theoretical distribution of pensioners used for this actuarial valuation.

2.4.4 Family structure

Information on the family structure of the insured population is necessary for the projection of survivors' benefits. Assumptions have to be established on the probability of being married at death, the average age of spouses, the average age of orphans and the probability of having a living parent. Examples of the assumptions appear in Table 30.

Table 30 Family statistics*

	Probability of being married		Average age spouse		Probability of having a living parent		Age of the youngest orphan	
Age	Males	Females	Males	Females	Males	Females	Males	Females
15-19	5.0 %	30.0 %	18	22	0.9852	0.9852	0	1
20-24	20.0 %	65.0 %	21	27	0.9676	0.9676	1	1
25-29	50.0 %	80.0 %	24	32	0.9341	0.9341	1	2
30-34	70.0 %	85.0 %	28	37	0.8738	0.8738	1	3
35-39	80.0 %	85.0 %	31	42	0.7739	0.7739	1	5
40-44	85.0 %	80.0 %	34	47	0.6267	0.6267	2	7
45-49	85.0 %	75.0 %	38	52	0.4421	0.4421	3	9
50-54	85.0 %	70.0 %	43	57	0.2553	0.2553	5	11
55-59	90.0 %	60.0 %	48	62	0.1119	0.1119	7	13
60-64	85.0 %	55.0 %	53	67	0.0339	0.0339	9	15
65-69	85.0 %	45.0 %	58	72	0.0062	0.0062	11	17
70-74	85.0 %	40.0 %	63	77	0.0005	0.0005	13	19
75-79	85.0 %	35.0 %	68	82	0.0000	0.0000	15	21
80-84	80.0 %	30.0 %	73	87	0.0000	0.0000	17	21
85-89	80.0 %	30.0 %	78	92	0.0000	0.0000	19	21
90-94	75.0 %	30.0 %	83	97	0.0000	0.0000	21	21
+ de 94	75.0 %	30.0 %	88	97	0.0000	0.0000	21	21

* These statistics come from Statistics Sierra Leone and the NASSIT. Calculations are from the author.

2.4.5 Adjustment of pensions in payment

Under the basic scenario, pensions in payment are assumed to be indexed in the future at a rate equal to 80 % of the average earnings increase for scheme participants as reflected in the fund by the end of the third quarter in the year of indexation (over October year n-1 to October year n).

2.4.6 Projection of the administrative costs

The initial administrative costs are assumed to be 3.5 % of total insurable earnings. The portion of the total administrative costs related to salaries is expected to increase according to the increase in average salary while other elements are assumed to increase according to inflation. Over the projection period, the average administrative costs as a percentage of total income will decrease from 3.5 % during the first year to 1.3 %, 20 years later. Two factors are responsible of this decrease: the growth of the insured population and a part of the total fees that is linked to inflation increase (which is assumed to be lower than the salary increase). Over this period, the average costs as a percentage of total earnings will be 2.0 %.

3 Demographic and financial projections

This valuation deals with the ability of the social security system to meet its future obligations at the time they fall due. This is done under an open-group approach. It is assumed that workers will continue to be insured with the NASSIT indefinitely, thus paying contributions and accruing benefit entitlements, and later receive benefits in accordance with the legal provisions of the scheme. Future contributions and benefits are calculated according to the demographic and economic assumptions presented in Chapter 2 and on the basis of the database and scheme-specific assumptions presented in section 2.4.

The main purpose of the valuation is to find out whether the financing of the NASSIT is on course, and not to exactly forecast numerical values. Due to the long-term nature of the assumptions, absolute figures include a high degree of uncertainty. Therefore, results have to be interpreted carefully and future actuarial reviews will have to be undertaken on a regular basis to check the actual experience in the light of the assumptions made.

This review deals with expenditures and income. Long-term benefits will attain a mature state only after the youngest persons of the first generation of contributors have become pensioners, have died and all survivors' pensions paid on their behalf have ceased. This requires that the situation of the scheme be analyzed over the next 50 years.

The general methodology of the valuation is described in Appendix 2.

3.1 Results of the projection for the basic scenario

Demographic projections are listed in Table 31 and Table 32. The information that appear in these two tables is reproduced in Figure 3 and Figure 4 respectively to better see the trends in the evolution of the demographic ratio (ratio of pensioners to active participants). We present these results separately for the public sector and the private sector because the pattern of the growth for pensioners is different for these two groups. In fact, in the public sector, because full length of service is recognized as at the actuarial valuation date there are more participants who are eligible to receive a pension. The total number of contributors follows the rate of growth of the population as described in the preceding chapter. For the two groups, the number of pensioners grows faster than the number of contributors because of the increasing entitlement to benefits of the successive generations. At the end of the projection period, there is more stability in the demographic ratio for the public sector than that for the private sector. This is due to the fact that the private sector is less mature than the public sector. The ratio of pensioners to contributors is a good indicator of the increasing cost of the scheme. This directly affects the pay-as-you-go cost of the scheme, as presented in the next section.

Table 31 Demographic projection, Public sector

Year	Numbers of active members and pensionners					Demographic ratio			
	Actives	Retireds	Invalids	Widows	Orphans	Retireds	Invalids	Widows	Orphans
2005	63 411	1 977	107	604	783	3.1 %	0.2 %	1.0 %	1.2 %
2009	60 753	6 277	507	3 113	4 051	10.3 %	0.8 %	5.1 %	6.7 %
2014	63 472	11 002	971	6 769	8 839	17.3 %	1.5 %	10.7 %	13.9 %
2019	66 449	15 987	1 390	11 029	13 432	24.1 %	2.1 %	16.6 %	20.2 %
2024	69 601	20 011	1 744	15 621	15 746	28.8 %	2.5 %	22.4 %	22.6 %
2029	72 939	23 394	2 044	20 089	16 642	32.1 %	2.8 %	27.5 %	22.8 %
2034	76 476	26 428	2 277	23 997	17 046	34.6 %	3.0 %	31.4 %	22.3 %
2039	80 223	27 275	2 464	27 084	17 190	34.0 %	3.1 %	33.8 %	21.4 %
2044	84 194	28 099	2 669	29 331	17 162	33.4 %	3.2 %	34.8 %	20.4 %
2049	88 402	30 359	2 889	30 910	16 986	34.3 %	3.3 %	35.0 %	19.2 %
2054	92 863	33 347	3 122	32 040	16 681	35.9 %	3.4 %	34.5 %	18.0 %

Figure 3 Demographic ratio, Public sector

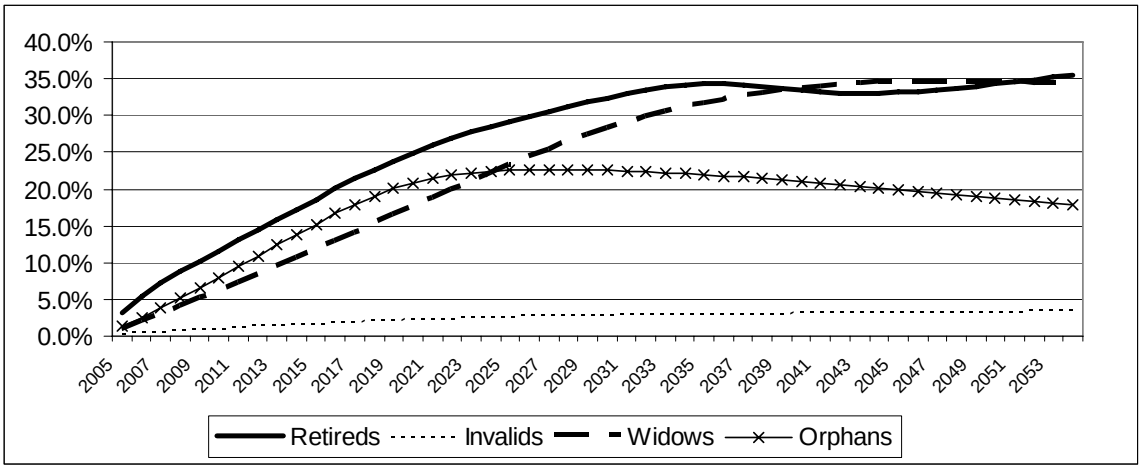
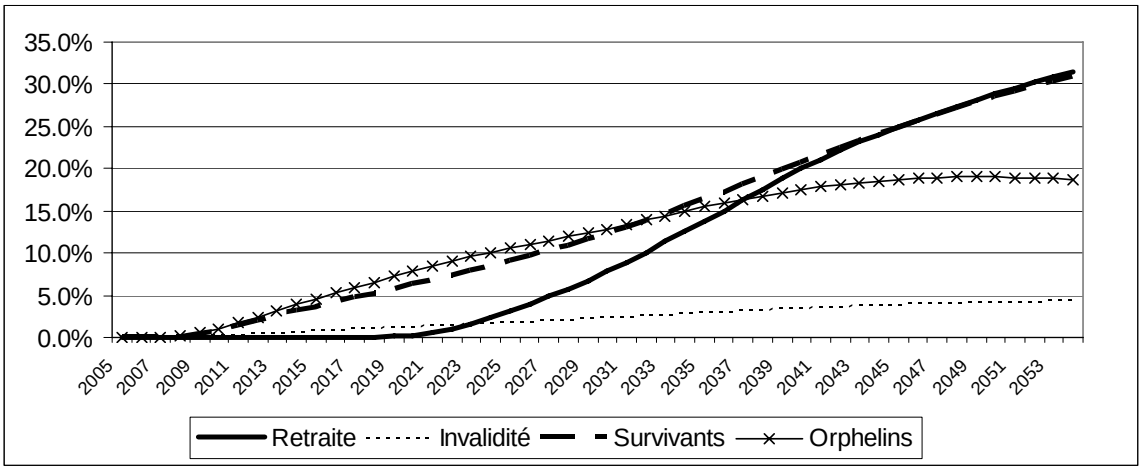


Table 32 Demographic projection, Private sector

Year	Numbers of active members and pensionners					Demographic ratio			
	Actives	Retireds	Invalids	Widows	Orphans	Retireds	Invalids	Widows	Orphans
2005	40 638	0	0	0	0	0.0 %	0.0 %	0.0 %	0.0 %
2009	51 704	0	38	199	255	0.0 %	0.1 %	0.4 %	0.5 %
2014	66 959	0	392	2 041	2 570	0.0 %	0.6 %	3.0 %	3.8 %
2019	82 683	91	907	4 730	5 946	0.1 %	1.1 %	5.7 %	7.2 %
2024	97 308	2 262	1 567	8 191	9 790	2.3 %	1.6 %	8.4 %	10.1 %
2029	109 095	7 387	2 353	12 593	13 520	6.8 %	2.2 %	11.5 %	12.4 %
2034	116 692	14 655	3 217	18 055	17 433	12.6 %	2.8 %	15.5 %	14.9 %
2039	123 362	23 212	4 073	24 435	21 212	18.8 %	3.3 %	19.8 %	17.2 %
2044	130 428	31 354	4 858	31 372	24 214	24.0 %	3.7 %	24.1 %	18.6 %
2049	137 914	38 869	5 573	38 393	26 200	28.2 %	4.0 %	27.8 %	19.0 %
2054	145 846	45 771	6 231	44 945	27 255	31.4 %	4.3 %	30.8 %	18.7 %

Figure 4 Demographic ratio, Private sector



3.1.1 Financial projections

Another indicator of the maturing process of the system is the replacement ratio. This ratio is the ratio of the average pension to the average insurable earnings (see Table 33 and Table 34). It indicates the evolution of average pensions compared with the average earnings during the projection period (what proportion of earnings is paid to pensioners). In the public sector, the replacement ratio is more stable than in the private sector. This is explained by different maturities in the two sectors. At the end of the projection period, lower replacement ratios for people in private sector versus those in the public sector are due to the fact that there is a greater expectation of periods of unemployment in the private sector. More precise scheme data and experience in the next actuarial valuation would permit the validation of this assumption. For the public sector, the decrease in the level of pensions when compared to earnings is explained mainly by the fact that pensions in payment are indexed at 80 % of the average increase in earnings and that the population is more mature because of credited past service.

For disability pensioners, replacement ratios are lower than those projected for the old age pension because people become invalid at a lower age. The replacement ratios for surviving spouses represent, in the long term, about 40 % of the disability pension replacement rate, because the pension formula provides 40 % of the old age pension to a surviving spouse, whereas the disability pension formula provides 100 % of the old age pension (with half of the difference between age 60 and the date of incidence is credited to pensioners).

Table 33 Replacement ratios, Public sector

Year	Average Insurable earnings Active	Average annual pensions				Remplacement ratio (in %)			
		Ret.	Inv.	Wid.	Orp.	Ret.	Inv.	Wid.	Orp.
2005	1 363 639	832 139	858 350	352 804	498 481	61	63	26	37
2009	1 948 027	1 087 345	1 106 875	444 873	646 968	56	57	23	33
2014	2 781 009	1 446 567	1 502 606	594 304	865 528	52	54	21	31
2019	3 671 016	1 970 191	1 981 358	766 429	1 107 592	54	54	21	30
2024	4 694 714	2 664 837	2 513 337	969 061	1 426 563	57	54	21	30
2029	6 003 348	3 446 870	3 117 675	1 219 708	1 845 884	57	52	20	31
2034	7 676 091	4 363 856	3 813 328	1 531 080	2 333 732	57	50	20	30
2039	9 814 082	5 423 767	4 626 916	1 916 766	2 893 190	55	47	20	29
2044	12 546 511	6 653 833	5 696 568	2 396 670	3 570 578	53	45	19	28
2049	16 038 392	8 284 968	7 146 542	2 992 661	4 458 054	52	45	19	28
2054	20 500 485	10 467 156	9 063 986	3 735 422	5 650 672	51	44	18	28

Table 34 Replacement ratios, Private sector

Year	Average Insurable earnings Active	Average annual pensions				Remplacement ratio (in %)			
		Ret.	Inv.	Wid.	Orp.	Ret.	Inv.	Wid.	Orp.
2005	3 132 512	0	0	0	0	0	0	0	0
2009	5 763 524	0	1 417 483	561 959	834 818	0	25	10	14
2014	8 910 815	3 419 137	2 369 853	939 476	1 402 872	38	27	11	16
2019	11 733 949	4 642 148	3 454 634	1 364 525	2 036 753	40	29	12	17
2024	14 970 823	6 062 641	4 774 275	1 877 586	2 833 620	40	32	13	19
2029	19 100 455	7 909 633	6 434 399	2 530 244	3 936 690	41	34	13	21
2034	24 369 034	10 249 907	8 530 058	3 361 571	5 341 414	42	35	14	22
2039	31 090 698	13 153 966	11 116 228	4 402 469	7 053 340	42	36	14	23
2044	39 666 199	16 754 588	14 327 806	5 704 097	9 167 586	42	36	14	23
2049	50 606 772	21 287 493	18 392 305	7 340 981	11 840 763	42	36	15	23
2054	64 564 626	27 089 100	23 527 675	9 401 735	15 230 203	42	36	15	24

The following tables (Table 35, Table 36 and Table 37) show the result of the financial projections in terms of cash-flows, pay-as-you-go (PAYG) rate, reserve, and equilibrium period (20 years). The contribution rate used in these projections is 15 % for both the private and the public sectors plus an additional 2.5 % for the public sector until 2021. The PAYG rate represents the contribution rate that would be required just to meet the expenditures of the scheme, year after year, in the absence of a reserve**.** In 2005, the scheme's PAYG rate (Table 35) is 6.0 %, thus significantly lower than the current contribution rate devoted to pensions. However, the PAYG rate is expected to increase in the future and reach 15.1 % in 2029 and 28.1 % in 2054.

Table 35 also shows that over the equilibrium period, the current contribution rate is sufficient to pay all the expenditures of the scheme (benefits and administrative costs) and helps accumulate a reserve that is higher than three times the benefit expenditure in the previous year (reserve ratio). In fact, at the end of the equilibrium period, in 2024, this ratio is 12.0. When looking at the private sector and the public sector separately, the picture is quite different. For the public sector,

at the end of the equilibrium period the ratio of reserve is -1.2, while for the private sector it is 26.5. To respect the condition that the contribution rate must be able to accumulate a reserve ratio of 3 at the end of the equilibrium period, the contribution rate for the public sector must be increased to 23.6 % while the one of the private sector must be decreased to 4.9 %. If the equilibrium period is 25 years instead of 20 years, these contribution rates are 26.0 %and 6.3 % respectively.

If the scheme had to be funded by a constant contribution rate over the next 50 years, this rate (the general average premium, or GAP) would be 17.5 %. The GAP may be compared to the current contribution rate devoted to pensions, which is 15.0 % of insurable earnings for the private sector and 17.5 % for the public sector.

Figure 5 and Figure 6 show the evolution of the PAYG rate for the private and the public sector, and the evolution of the reserve throughout the projection period.

Table 35 Financial projections, All sectors, in millions of leones

Years	Contributions	Investment Earnings	Other Income	Benefits	Administrative Expenses	Surplus (Deficit)	Reserve (end of the year)	Pay-as-you-go rate	Reserve Ratio
2005	33 869	16 233	3 082	5 236	7 410	40 538	116 998	6.0%	9.3
2006	40 102	21 213	5 066	7 739	8 329	50 313	167 311	6.3%	10.4
2007	48 020	25 946	0	10 771	9 241	53 954	221 265	6.6%	11.1
2008	56 537	29 036	0	13 923	10 116	61 534	282 799	6.7%	11.8
2009	65 567	30 634	0	17 345	10 921	67 934	350 733	6.8%	12.4
2010	74 653	36 416	0	21 449	11 624	77 996	428 729	6.9%	13.0
2011	84 678	42 667	0	26 557	12 281	88 506	517 235	7.2%	13.3
2012	95 675	49 325	0	32 678	12 959	99 363	616 599	7.5%	13.5
2013	107 669	56 317	0	39 835	13 658	110 493	727 092	7.8%	13.6
2014	120 672	63 557	0	48 028	14 376	121 825	848 917	8.1%	13.6
2015	133 108	70 891	0	57 213	15 112	131 674	980 590	8.5%	13.6
2016	146 192	78 134	0	67 651	15 863	140 811	1 121 402	8.9%	13.4
2017	159 859	85 143	0	79 148	16 627	149 228	1 270 629	9.3%	13.3
2018	174 032	91 782	0	91 559	17 401	156 853	1 427 482	9.7%	13.1
2019	188 614	102 802	0	104 953	18 183	168 280	1 595 762	10.1%	13.0
2020	204 143	114 631	0	119 055	19 001	180 718	1 776 481	10.5%	12.9
2021	220 647	127 293	0	135 208	19 856	192 876	1 969 357	10.9%	12.7
2022	230 815	140 537	0	152 871	20 750	197 731	2 167 088	11.3%	12.5
2023	248 897	154 325	0	172 499	21 685	209 037	2 376 125	11.7%	12.2
2024	267 990	168 858	0	194 497	22 663	219 688	2 595 813	12.2%	12.0
2029	378 870	249 526	0	352 591	28 262	247 543	3 799 281	15.1%	10.0
2034	515 450	327 815	0	609 297	35 266	198 702	4 927 903	18.8%	7.6
2039	694 553	372 652	0	979 024	44 029	44 152	5 507 588	22.1%	5.4
2044	936 036	341 589	0	1 483 258	55 002	-260 634	4 888 189	24.7%	3.2
2049	1 261 678	168 958	0	2 175 133	68 748	-813 245	2 049 439	26.7%	0.9
2054	1 700 875	-249 681	0	3 105 779	85 978	-1 740 562	-4 616 856	28.1%	-1.4

The amount in the column "other revenues" represent the indebtedness

Table 36 Financial projections, Public sector, in millions of leones

Years	Contributions	Investment Earnings	Other Income	Benefits	Administrative Expenses	Surplus (Deficit)	Reserve (end of the year)	Pay-as-you-go rate	Reserve Ratio
2005	14 774	8 349	3 082	4 148	4 861	17 196	58 484	10.7%	6.5
2006	14 826	10 036	5 066	6 022	5 232	18 673	77 157	13.3%	6.9
2007	16 836	11 386	0	8 213	5 651	14 358	91 516	14.4%	6.6
2008	18 823	11 460	0	10 614	6 100	13 569	105 085	15.5%	6.3
2009	20 867	10 883	0	13 194	6 503	12 053	117 138	16.5%	5.9
2010	22 751	11 636	0	16 137	6 800	11 449	128 587	17.6%	5.6
2011	24 729	12 240	0	19 504	7 001	10 465	139 052	18.8%	5.2
2012	26 797	12 666	0	23 370	7 190	8 903	147 955	20.0%	4.8
2013	28 947	12 873	0	27 759	7 379	6 683	154 638	21.2%	4.4
2014	31 174	12 826	0	32 666	7 575	3 758	158 396	22.6%	3.9
2015	33 467	12 491	0	38 062	7 789	107	158 503	24.0%	3.5
2016	35 817	11 846	0	43 949	7 992	-4 279	154 224	25.4%	3.0
2017	38 212	10 876	0	50 254	8 196	-9 362	144 862	26.8%	2.5
2018	40 639	9 581	0	56 908	8 403	-15 092	129 770	28.1%	2.0
2019	43 084	8 365	0	63 990	8 617	-21 159	108 611	29.5%	1.5
2020	45 677	6 717	0	71 420	8 858	-27 883	80 728	30.8%	1.0
2021	48 428	4 592	0	79 216	9 065	-35 262	45 466	31.9%	0.5
2022	44 009	1 691	0	87 347	9 144	-50 790	-5 325	32.9%	-0.1
2023	46 661	-2 064	0	95 812	9 337	-60 553	-65 877	33.8%	-0.6
2024	49 473	-6 509	0	104 608	9 516	-71 160	-137 037	34.6%	-1.2
2029	66 304	-41 453	0	155 307	10 308	-140 763	-689 201	37.5%	-4.2
2034	88 899	-105 716	0	216 788	11 305	-244 911	-1 692 280	38.5%	-7.4
2039	119 240	-210 809	0	279 545	12 538	-383 653	-3 316 420	36.7%	-11.4
2044	159 999	-372 420	0	359 900	14 449	-586 771	-5 808 802	35.1%	-15.5
2049	214 771	-619 879	0	475 992	17 202	-898 302	-9 625 315	34.4%	-19.5
2054	288 400	-997 928	0	638 908	20 901	-1 369 337	-15 453 162	34.3%	-23.4

Table 37 Financial projections, Private sector, in millions of leones

Years	Contributions	Investment Earnings	Other Income	Benefits	Administrative Expenses	Surplus (Deficit)	Reserve (end of the year)	Pay-as-you-go rate	Reserve Ratio
2005	19 095	7 884	0	1 089	2 549	23 342	58 513	2.9%	16.1
2006	25 277	11 177	0	1 717	3 097	31 640	90 153	2.9%	18.7
2007	31 184	14 560	0	2 557	3 590	39 596	129 749	3.0%	21.1
2008	37 714	17 576	0	3 309	4 016	47 965	177 714	2.9%	24.3
2009	44 699	19 751	0	4 151	4 418	55 881	233 595	2.9%	27.3
2010	51 902	24 781	0	5 311	4 824	66 547	300 142	2.9%	29.6
2011	59 948	30 427	0	7 054	5 280	78 041	378 183	3.1%	30.7
2012	68 878	36 659	0	9 308	5 769	90 460	468 644	3.3%	31.1
2013	78 722	43 444	0	12 076	6 279	103 811	572 454	3.5%	31.2
2014	89 499	50 732	0	15 362	6 802	118 066	690 521	3.7%	31.2
2015	99 641	58 399	0	19 151	7 323	131 567	822 087	4.0%	31.1
2016	110 375	66 288	0	23 702	7 871	145 090	967 177	4.3%	30.6
2017	121 648	74 267	0	28 894	8 431	158 590	1 125 767	4.6%	30.2
2018	133 393	82 201	0	34 651	8 998	171 945	1 297 713	4.9%	29.7
2019	145 530	94 438	0	40 963	9 566	189 439	1 487 152	5.2%	29.4
2020	158 466	107 914	0	47 635	10 143	208 602	1 695 753	5.5%	29.3
2021	172 219	122 702	0	55 992	10 791	228 138	1 923 891	5.8%	28.8
2022	186 806	138 845	0	65 523	11 607	248 522	2 172 413	6.2%	28.2
2023	202 236	156 389	0	76 687	12 348	269 590	2 442 003	6.6%	27.4
2024	218 518	175 366	0	89 889	13 147	290 847	2 732 850	7.1%	26.5
2029	312 566	290 979	0	197 284	17 954	388 306	4 488 483	10.3%	20.9
2034	426 552	433 531	0	392 509	23 961	443 613	6 620 183	14.6%	15.9
2039	575 313	583 462	0	699 479	31 491	427 805	8 824 008	19.1%	12.1
2044	776 038	714 009	0	1 123 358	40 553	326 136	10 696 991	22.5%	9.2
2049	1 046 907	788 837	0	1 699 140	51 547	85 057	11 674 755	25.1%	6.7
2054	1 412 475	748 248	0	2 466 871	65 077	-371 226	10 836 306	26.9%	4.3

Figure 5 Pay-as-you-go rate, public sector, private sector and both sectors combined

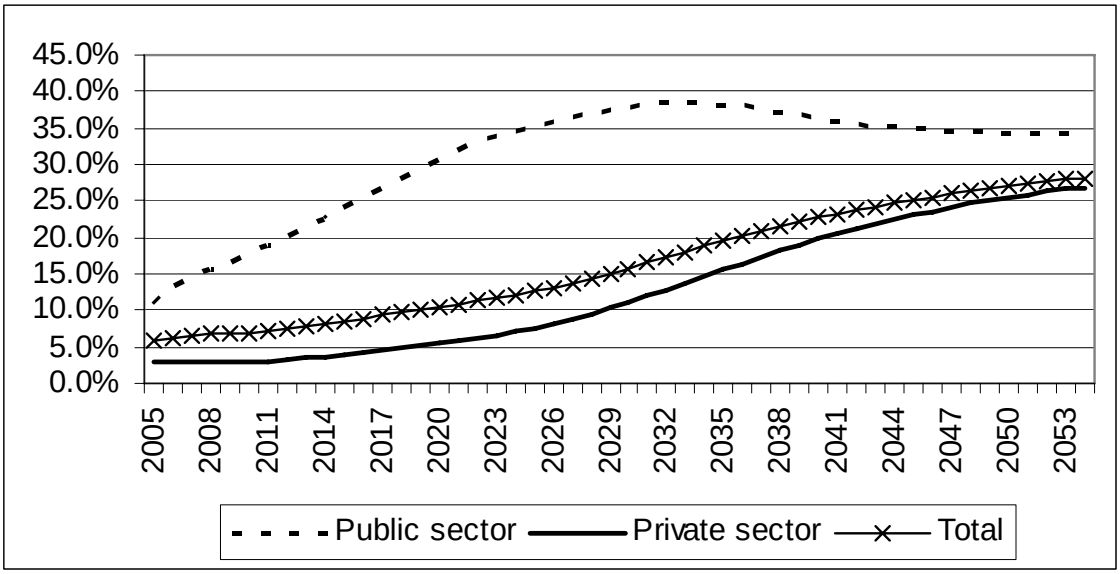
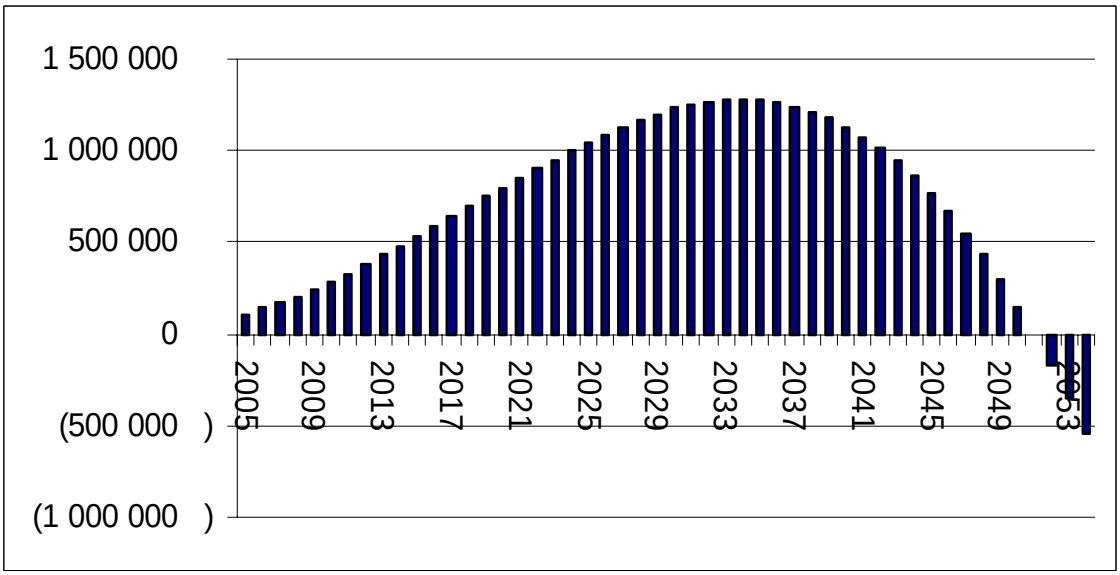


Figure 6 Development of the reserve, 2005-2054 (Constant Leones of 2005)



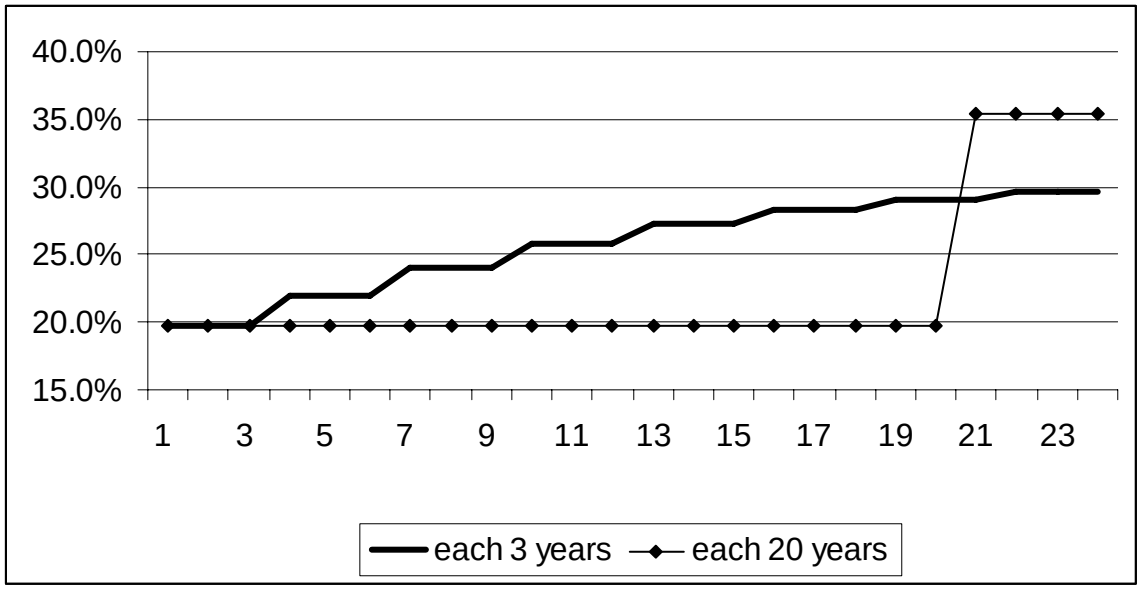
3.1.2 Comparison with previous actuarial valuation

We saw in the previous section that the required contribution rate that permits the accumulation of an adequate reserve ratio at the end of the equilibrium period is 23.6 % for the public sector and 4.9 % for the private sector. For the private sector the contribution rate is about the same as the one described in the inception report (5 %).

Currently, the total contribution rate for the public sector is 17.5 % and has been established with information from the inception report. This is lower than the rate of 23.6 % presented in the current valuation**.** The difference between these two rates could be explained by the following:

- Use of the same assumption as the one in the inception report regarding administrative expenditures would reduce the rate from 23.6 % to 20.1 %.
- As illustrated in the following figure, there is a normal increase in the contribution rate because the period of 20 years moves over time. We know that the PAYG rate increases with time. According to this, we estimate that there is an increase of 1.6 % in the contribution rate to reflect the shifting of the equilibrium period. Without this shifting, the rate would has been 18.5 % (20.1 % - 1.6 %)
- The rest of the difference is 1.0 % (18.5 % - 17.5 %) and is due to differences in assumptions and starting populations between this actuarial review and the one shown in the inception report.

Figure 7 Illustration of different patterns of increase in contribution rate, with a starting rate of 20 %



In the preceding figure, the contribution rate is 20 % for the first three years. In the first strategy (each 3 years) the contribution rate is increased each 3 years so that at the end of each 20 years, the ratio of reserve is always 3. In the second strategy (each 20 years), the contribution rate is not increased until the first period of 20 years has ended. After that period, the rate must be increased considerably (35 % - 20 % = 15 %) so that at the end of the second period of 20 years, the reserve

ratio is 3. This illustrate that, even if the objective is attained at the end of an equilibrium period, it is preferable to increase the rate of contribution during this period to keep the increase sustainable for the contributors.

3.1.3 Additional services for the private sector

We saw in the previous section that the contribution rate in the private sector is higher than the one that is needed to pay the cost of benefits over the equilibrium period. The reason is that for the private sector, there is no mechanism for recognizing past service. Given the contribution rates for each sector, this situation seems unfair. There is enough room in the contribution rate to take into account, to some degree, the past service of people working in the private sector. We simulate the following situation:

- Additional service credit granted at the time of affiliation (from 2002 to the end of 2006)
    - To qualify:
        - At time of affiliation, age must be above 30 years and;
        - At the end of 2006, the participant must have contributed to the scheme for at least 27 months of the first 36 months of his affiliation.
    - Additional service granted:
        - Half of the period between the age at the time of affiliation and age 30.

Table 38 shows that even with this grandfathering provision, the ratio of reserve compared to the total expenditures of the previous year is higher than our target of 3. In fact, this ratio is 7.1 in 2024. This approach restores an element of equity in the scheme. The impact on the scheme has been evaluated using a very conservative scenario related to the number of people eligible to the grandfathering provision. The most important thing is to verify the ability of the scheme to bear the additional cost of the grandfathering provision.

Table 38 Financial projections, all sectors, in millions of leones – with a grandfathering provision for the private sector

Years	Contributions	Investment Earnings	Other Income	Benefits	Administrative Expenses	Surplus (Deficit)	Reserve (end of the year)	Pay-as-you-go rate	Reserve Ratio
2005	33 869	16 209	3 082	5 133	7 410	40 617	116 893	5.9%	9.3
2006	40 102	21 146	5 066	8 386	8 329	49 599	166 492	6.6%	10.0
2007	48 020	25 738	0	12 147	9 241	52 371	218 862	7.0%	10.2
2008	56 537	28 597	0	16 519	10 116	58 499	277 361	7.4%	10.4
2009	65 567	29 888	0	21 480	10 921	63 053	340 414	7.8%	10.5
2010	74 653	35 140	0	27 357	11 624	70 812	411 226	8.2%	10.5
2011	84 678	40 681	0	34 272	12 281	78 806	490 031	8.6%	10.5
2012	95 675	46 453	0	42 306	12 959	86 862	576 893	9.0%	10.4
2013	107 669	52 380	0	51 513	13 658	94 878	671 771	9.4%	10.3
2014	120 672	58 379	0	61 946	14 376	102 729	774 500	9.9%	10.1
2015	133 108	64 293	0	73 633	15 112	108 657	883 157	10.4%	10.0
2016	146 192	69 944	0	86 769	15 863	113 504	996 661	10.9%	9.7
2017	159 859	75 198	0	101 295	16 627	117 135	1 113 796	11.5%	9.4
2018	174 032	79 920	0	117 226	17 401	119 325	1 233 121	12.0%	9.2
2019	188 614	88 160	0	135 091	18 183	123 500	1 356 621	12.6%	8.9
2020	204 143	96 664	0	154 717	19 001	127 089	1 483 710	13.2%	8.5
2021	220 647	105 353	0	177 245	19 856	128 899	1 612 609	13.8%	8.2
2022	230 815	113 880	0	201 843	20 750	122 102	1 734 711	14.5%	7.8
2023	248 897	122 138	0	228 312	21 685	121 038	1 855 749	15.1%	7.4
2024	267 990	130 296	0	256 565	22 663	119 057	1 974 806	15.6%	7.1
2029	378 870	166 573	0	431 004	28 262	86 176	2 491 414	18.2%	5.4
2034	515 450	179 971	0	685 047	35 266	-24 892	2 629 483	21.0%	3.7
2039	694 553	137 013	0	1 041 818	44 029	-254 282	1 873 737	23.5%	1.7
2044	936 036	-10 989	0	1 529 222	55 002	-659 177	-524 590	25.4%	-0.3
2049	1 261 678	-341 059	0	2 205 732	68 748	-1 353 861	-5 762 085	27.0%	-2.5
2054	1 700 875	-974 902	0	3 124 228	85 978	-2 484 232	-15 711 757	28.3%	-4.9

3.2 Sensitivity analysis

3.2.1 Insured population growth

For the private sector, the population growth assumption in the basic scenario can be said to be high. Therefore, a sensitivity test using a lower growth rate was performed. Table 39 shows population growth under both scenarios.

Table 39 Population growth assumption for the private sector, basic and alternate scenario

Basic scenario	2005	2006	2010	2020	2030	2033 and over
Males	6.6 %	6.4 %	5.6 %	3.6 %	1.6 %	1.0 %
Females	7.1 %	6.9 %	6.1 %	4.1 %	2.1 %	1.5 %
Low growth scenario	**2005**	**2006**	**2010**	**2020**	**2030**	**2033 and over**
Males	3.3 %	3.2 %	2.8 %	1.8 %	1.0 %	1.0 %
Females	3.6 %	3.5 %	3.1 %	2.1 %	1.5 %	1.5 %

Table 40 shows the results of the projection. The reserve ratio after 20 years is 8.7, lower than in the basic scenario but still superior to the target of 3.

A second sensitivity test was also performed, combining the scenario of low growth with the additional grandfathering provision for private sector. Under this scenario, the reserve ratio after 20 years is 4.4, which is still greater than our target. These results show that a well-designed grandfathering provision would not jeopardize the private sector fund.

Table 40 Financial projections, all sectors, in millions of leones – low growth scenario for the private sector

Years	Contributions	Investment Earnings	Other Revenue	Benefits	Administrative Expenses	Surplus (Deficit)	Reserve (end of the year)	Pay-as-you-go rate	Reserve Ratio
2005	33 270	16 194	3 082	5 093	7 270	40 183	116 642	6.0%	9.4
2006	38 562	21 038	5 066	7 728	8 172	48 765	165 407	6.5%	10.4
2007	45 252	25 494	0	10 741	9 067	50 939	216 346	6.9%	10.9
2008	52 201	28 197	0	13 860	9 925	56 613	272 959	7.2%	11.5
2009	59 326	29 351	0	17 231	10 715	60 731	333 690	7.4%	11.9
2010	66 203	34 379	0	21 266	11 405	67 911	401 601	7.8%	12.3
2011	73 609	39 642	0	26 278	12 049	74 924	476 525	8.2%	12.4
2012	81 543	45 057	0	32 267	12 714	81 619	558 144	8.7%	12.4
2013	89 999	50 526	0	39 246	13 400	87 879	646 023	9.2%	12.3
2014	98 961	55 948	0	47 210	14 105	93 595	739 617	9.7%	12.1
2015	107 241	61 175	0	56 106	14 827	97 483	837 101	10.4%	11.8
2016	115 777	66 047	0	66 089	15 563	100 172	937 273	11.1%	11.5
2017	124 520	70 444	0	77 017	16 313	101 635	1 038 908	11.8%	11.1
2018	133 414	74 261	0	88 725	17 072	101 878	1 140 786	12.4%	10.8
2019	142 398	81 271	0	101 258	17 840	104 571	1 245 358	13.1%	10.5
2020	151 887	88 468	0	114 309	18 642	107 404	1 352 761	13.7%	10.2
2021	161 900	95 832	0	128 797	19 482	109 453	1 462 214	14.4%	9.9
2022	165 122	103 066	0	144 473	20 359	103 356	1 565 570	15.0%	9.5
2023	175 801	110 073	0	161 758	21 276	102 840	1 668 410	15.6%	9.1
2024	187 037	116 995	0	181 029	22 235	100 769	1 769 179	16.3%	8.7
2029	252 665	145 133	0	317 226	27 729	52 843	2 157 908	20.5%	6.3
2034	340 173	143 332	0	529 201	34 600	-80 297	2 060 219	24.9%	3.7
2039	458 073	79 531	0	811 943	43 198	-317 537	992 562	28.0%	1.2
2044	616 950	-84 892	0	1 160 253	53 964	-682 160	-1 627 848	29.5%	-1.3
2049	831 079	-404 273	0	1 610 999	67 451	-1 251 642	-6 643 600	30.3%	-4.0
2054	1 119 728	-966 133	0	2 206 883	84 355	-2 137 643	-15 405 164	30.7%	-6.7

3.2.2 The real cost of the scheme

The current contribution rate does not represent the true cost of the pension scheme. This is due to the demography of the scheme. Presently, there is a large number of contributors who are paying the cost of benefits. By analogy, the fact that ten persons pay for a car, doesn't change the real price of the car. It only changes the amount (share) that each person will spend for the car. We saw in the previous section that the PAYG rate is expected to increase over the entire period of projection. This is an indication that the real cost of the scheme is higher than the GAP that we could, at this time, measure for the equilibrium period.

On the other hand, the contribution rate that should be paid by each participant during their active life to pay their own cost of the scheme is around 25 % (doing this, we eliminate the impact of the demography on the scheme). This rate simply tells us that the scheme's contribution rate will tend towards this level (and may even be higher). Higher growth rate of the active population or higher investment performance are elements that could delay the moment when an increase in the contribution rate will be necessary.

3.2.3 Mortality rates

Mortality rates are one of the major assumptions in an actuarial valuation. This actuarial valuation is based on the mortality table published by UN. When a scheme is young, as is the case for the NASSIT, mortality rates for the active population are a more important issue than the rates for the retired population. As the scheme matures, the mortality rates for the retired population will become more important. Using a different pattern of mortality, even if life expectancy at birth is unchanged, could impact the cost of the scheme. For example, we have simulated the impact of using a mortality table that give higher mortality rates at young ages than in the basic scenario but the same life expectancy at birth. The contributions rate over the equilibrium period increased by only about 3 % in reason of this change.

For the next actuarial valuation, more emphasis should be given to the elaboration of a mortality table that would reflect the information contained in the most recent census done in Sierra Leone.

3.2.4 Early retirement reduction factor

Elimination of the reduction factor for early retirement for police and military personnel represents a charge to the scheme. Inclusion of this element in our projection does not affect the viability of the scheme as a whole. The ratio of the reserve at the end of the equilibrium period decreases from 12.0 under the basic scenario to 11.8 under this test.

This low impact is due to the reduction in the proportion of police and military personnel in the covered population over the forecast period. The small impact of the simulation on the cost of the scheme does not mean that this modification is not expensive. In order to finance this new benefit and to preserve equity in the scheme, the contribution rate for police and military personnel would have to be increased by 2 %.

3.2.5 Purchase of credits

A proposal for reform that would allow participants from the private sector to buy additional service is currently under study. This would enable these participants to benefit from better

pensions at retirement. As requested in the terms of reference, the following table shows the factors that could be used in the determination of the purchase price of additional credits. Factors are shown by age and sex. To calculate this price, we use the same formula as in the *Proposed policy and procedures for the purchase of credits in the NASSIT scheme*. The formula is:

Purchase price = (number of years x annual salary x factor)

This factor is calculated in such a way that a participant who purchase additional service will pay the full price of a lifetime pension. For example, if the annual salary is 2 000 000 leones and a 50 year-old man purchases 5 additional years of credited service (this is equivalent to an additional lifetime pension of 200 000 leones (5 x 2 % x 2 000 000)), the price will be 2 300 000 leones. This amount is higher than his salary. Obviously, nobody will be interested in this strategy due to its cost.

To avoid that problem, a subsidy could be embedded in the purchase price. For example, the illustrated factors could be decreased by 50 %. In our example, the purchase price would thus be reduced to 1 150 000 leones.

The establishment of the purchase price of past credits, if any, remains a political design issue. However, in our opinion, the method should depend on the design of the grandfathering provision for the private sector. If there is no grandfathering provision, the purchase price should be more subsidized that if there is a grandfathering provision. Factors shown in Table 41 are established using demographic (mortality rates, proportion of people married) and economic assumptions (real interest rates) from the current actuarial valuation.

Table 41 Factors for the purchase of additional past service, without subsidy

	Factors			Factors	
Age	Male	Female	Age	Male	Female
18	0.110	0.118			
19	0.113	0.121	40	0.187	0.186
20	0.116	0.124	41	0.190	0.189
21	0.119	0.126	42	0.194	0.193
22	0.123	0.129	43	0.198	0.197
23	0.126	0.132	44	0.202	0.201
24	0.129	0.135	45	0.207	0.205
25	0.133	0.137	46	0.211	0.209
26	0.136	0.140	47	0.215	0.213
27	0.139	0.143	48	0.220	0.218
28	0.143	0.146	49	0.225	0.222
29	0.147	0.149	50	0.230	0.227
30	0.150	0.152	51	0.235	0.231
31	0.153	0.155	52	0.240	0.236
32	0.157	0.159	53	0.246	0.240
33	0.160	0.162	54	0.251	0.245
34	0.164	0.165	55	0.256	0.250
35	0.168	0.168	56	0.260	0.255
36	0.171	0.172	57	0.264	0.260
37	0.175	0.175	58	0.254	0.251
38	0.179	0.179	59	0.243	0.241
39	0.183	0.182	60	0.234	0.232

4 Final comments

We carried out the actuarial valuation of Sierra Leone's National Social Security and Insurance Trust as at 31 December 2004. Our methodology is based on a model developed by the ILO for reviewing the long-term actuarial and financial status of national pension schemes. The model has been adjusted to fit the particular situation of the Sierra Leone's Social Security system. In general, the data used to establish the initial covered population and its characteristics are not complete. Also, for the initial pensions in payment, we use a theoretical distribution to take into account the real past service credited to employees in the public sector. However, we believe that the estimates used constitute a reasonable approximation of reality.

An actuarial valuation requires many assumptions. These assumptions are coherent as a whole, must not be considered individually and are selected to reflect long-term trends rather than giving undue weight to recent experience. The objective of pension projections is not to forecast the exact development of the scheme's income and expenditures, but to verify its financial viability.

We consider the next actuarial valuation to be very important because more scheme experience should be available to increase the precision of the exercise.

Appendix 1
Overview of the legal provisions of the scheme administered by the NASSIT

A1.1. General:

The social security system came into effect in 2002 under the *National Social Security and Insurance Trust Act, 2001*. The scheme is administered by the National Social Security and Insurance Trust. The trust consists of:

- The Board of Trustees;
- The Director-General;
- Other persons employed by the trust under the *Act*.

The Board of Trustees is composed of:

- A Chairman;
- One senior official representing the ministry responsible for labor and social security;
- One senior official representing the ministry responsible for finance;
- One senior official representing the ministry responsible for social welfare;
- One senior official representing the Bank of Sierra Leone;
- Two members representing the Sierra Leone Employers Federation;
- Two members representing the Sierra Leone Labor Congress;
- One representative of the Sierra Leone Teachers Association;
- One representative of the Sierra Leone Insurance Association;
- One representative of the Civil Servants Association;
- One representative of the Social Security Pensioners Association;
- One representative of the military;
- The Director-General of the NASSIT.

A1.2. Coverage:

The scheme covers all employees in the public and the private sector. Self-employed workers can be covered on a voluntary basis. Workers must retire no later than age 60.

A1.3. Funding:

The scheme is funded by contributions from employers and employees, as follows:

	Contribution rate	
	Employee	Employer
Employees in the public and the private sector	5.0 %	10.0 %
Self-employed workers	15.0 %	

The government pays an additional contribution rate of 2.5 % during 20 years for crediting past service.

A1.4. Eligibility:

A) Old age benefits:

a) Pension:
- Age 55 with a minimum of 180 months of contribution or earned credits. No retirement possible before age 55.
- People aged 60 and over are entitled to a full pension. A reduced pension is paid for early retirement between 55 and 60 years.
- People aged over 55 and who do not meet the minimum number of months of the qualifying period are entitled to make up the shortfall by purchasing additional earned credits.

b) Grant:
- For those who are not buying additional years of service to make up the shortfall in the qualifying period.

B) Disability benefits:

a) Pension:
- Person is aged under 60 and;
- Person is permanently and totally incapable of further employment as assessed by the medical board and;
- Person has earned contributions credit
  - for at least 60 months of which 12 months must have been paid during the 36 months preceding the commencement of disability or
  - for at least 180 months;
- The pension ends according to the decision of the medical board or if age of the pensioner is 60 (converted into an old age pension) or if the person go back to work.

b) Grant:

For persons who are not eligible for the disability pension.

C) Survivors' benefits:

a) Pension:
- The deceased participant;
  - was receiving or is entitled to an old age pension or a disability pension or;
  - has contributed for at least 60 months of which 12 months must have been paid during the 36 months preceding the death and would have been entitled to disability pension at time of death
  - for at least 180 months;

b) Grant:

For survivors when the deceased did not meet the qualifying conditions for giving entitlement to a survivors' pension.

A1.5. Amount of benefits:

A) Old age:

a) Pension: 30 % of the average monthly earnings for the first 180 months of contribution or earned credits, plus 2 % for each additional period of 12 months of contribution or earned credits. Average earnings for calculating the pension defined as average earnings of the best 5 years. The pension cannot exceed 80 % of the reference earnings. Minimum pension is equal to 50 % of the minimum wage.

For early retirement, the pension calculated above is reduced by 4 % for each year below age 60.

b) Gratuity: A lump sum equal to 12 months of initial pension is paid as gratuity on the retirement of each person.

c) Grant: 1.5 times average monthly earnings for every 12 months of paid contributions.

B) Disability:

a) Pension: 30 % of average earnings for the first 180 months of earned credits, plus 2 % for each additional period of 12 months of earned credits. The contribution period is increased by 6 months for each year between the commencement of the disability and age 60. Average earnings for calculating the pension defined as average earnings of the best 5 years. The pension cannot be less than 50 % of the minimum wage.

b) Grant: 1.5 times average monthly earnings for every 12 months of paid contribution.

C) Survivors:

a) Widow or widower: 40 % of the participant's pension (the contribution period is increased by 6 months for each year between the death and the age 60). If more than one widow, the pension is shared equally. The pension ceases on remarriage. If a widow remarries or dies, her part is reallocated to the other widows, if any.

b) Orphan: 60 % of the participant's pension. The pension ceases at age 18 or 23 if in full time-education or at death if the dependant is disabled. If the deceased leaves no widow or widower the pension amount is reallocated to the dependent children. A single child cannot receive more than 60 % of the participant's pension. If a child ceases to be a dependent child, his pension is reallocated to other dependent children, if any.

c) Lump sum: if participant leaves no widow or widower or dependent children, a lump sum equal to 12 months of survivor pension is paid to the participant's surviving parents who are pensioners or unemployed (if the surviving parents are not pensioners or unemployed the number of months is 24).

d) Grant: 1.5 times the average monthly earnings of the deceased for every 12 months of paid contributions. This amount is shared by all the dependants.

E) Benefit adjustment:

Indexation is according to increases in employment earnings as reflected in the fund of the Trust.

Appendix 2
Methodology of the actuarial valuation

This actuarial review makes use of the comprehensive methodology developed at the Financial, Actuarial and Statistical Services of the ILO for reviewing the long-term actuarial and financial status of national pension schemes. The review was undertaken by modifying the generic version of the ILO modeling tools in order to fit the situation of Sierra Leone and of the social security system in particular. These modeling tools include a population model, an economic model, a labor force model, a wage model, a long-term benefits model and a short-term benefits model.

A2.1. Modeling the demographic and economic developments

Normally, the use of the ILO actuarial projection model required the development of demographic and economic assumptions related to the general population, the economic growth, the labor market and the increase and distribution of wages. Other economic assumptions relate to the future rate of return on investments, the indexation of benefits and the adjustment of parameters like the maximum insurable earnings and the future level of flat-rate benefits.

The selection of projection assumptions took into account the recent experience of Sierra Leone to the extent that this information was available. The assumptions were selected to reflect long-term trends rather than giving undue weight to recent experience. The detailed description of the demographic and economic assumptions is presented in the Chapter 2.

A2.1.1. Active Population

The projection of the labor force, i.e. the number of persons available for work, is normally obtained by applying assumed labor force participation rates to the projected number of persons in the general population. An unemployment rate is assumed for the future and aggregate employment is calculated as the difference between labor force and unemployment. The model assumes movement of participants between the groups of active and inactive insured persons.

However, given the low level of insured people compared to the general population (and even the working population), our actuarial analysis voluntarily omits the analysis and the projection of the general and working population. When data from the 2003-2004 survey will become available, it will be interesting to increase the scope of the valuation.

In our model, the active population is projected starting with most current data on active participants, and applying appropriate mortality, disability and retirement rates. The assumption concerning mortality rates was selected to replicate the medium scenario of the 2002 World Population Prospects in term of life expectancy.

A2.1.2. Economic growth and inflation

Real rates of economic growth, labor productivity increases and inflation rates are exogenous inputs to the economic model.

A2.1.3. Salaries

Based on an allocation of total GDP to capital income and to labor income, a starting average wage is normally calculated by dividing the wage share of GDP by the total number of employed persons. In the medium-term, real wage development is checked against labor productivity growth. In specific labor market situations, wages might grow at a pace faster or slower than productivity. However, due to the long-term perspective of the present study, the real wage increase is normally assumed to gradually converge to real labor productivity. It is expected that wages will adjust to efficiency levels over time. Wage growth is also influenced by an assumed gradual annual increase of the total labor income share of GDP over the projection period which is concomitant with the assumed GDP growth.

However, considering the absence of a complete macroeconomic framework for the analysis of remuneration, the real wage increase in our model is based on a long term assumption frequently observed in other actuarial valuation.

Wage distribution assumptions are also needed to simulate the possible impact of the social protection system on the distribution of income, for example through minimum and maximum pension provisions. Assumptions on the differentiation of wages by age and sex are established, as well as assumptions on the dispersion of wages between income groups. Average earnings which are used in the computation of benefits are also projected.

A2.2. Modeling the financial development of the social Insurance scheme

The present actuarial review addresses all income and expenditure items of the long-term (pension) benefits.

Projections for pensions are done for each sex separately. Moreover, there is separation by groups of insured (workers in the private sector on the one side, workers in the public sector (military personnel, police, teachers and civil servants) on the other side).

A2.2.1. Purpose of pension projections

The purpose of the pension model is twofold. First, it is used to assess the financial viability of the Long-term benefits branch. This refers to the measure of the long-term balance between income and expenditures of the scheme. In case of imbalance, a revision of the contribution rate or the benefit structure is recommended. Second, the model may be used to examine the financial impact of different reform options, thus assisting policy makers in the design of benefit and financing provisions. More specifically, the pension model is used to develop long-term projections of expenditures and insurable earnings under the scheme, for the purpose of:

- assessing the options for building up a contingency or a technical reserve;
- proposing schedules of contribution rates consistent with the funding objective;
- testing how the system reacts to changing economic and demographic conditions.

A2.2.2. Pension data and assumptions

Pension projections require the demographic and macro-economic framework already described and, in addition, a set of assumptions specific to the social insurance scheme.

The database as at the valuation date includes the insured population by active and inactive status, the distribution of insurable wages among contributors, the distribution of past credited service and pensions in payment. Data are disaggregated by age and sex.

Scheme-specific assumptions such as disability incidence rates and the distribution of retirement by age are determined with reference to scheme provisions and the scheme's historical experience. The data and assumptions specific to the NASSIT are presented in detail in chapter 2.

A2.2.3. Pension projection approach

Pension projections are made following a year-by-year cohort methodology. The existing population is aged and gradually replaced by successive cohorts of participants on an annual basis according to the demographic and coverage assumptions. The projection of insurable earnings and benefit expenditures are then performed according to the economic assumptions and the scheme's provisions.

Pensions are long-term benefits. Hence the financial obligations that a society accepts when adopting financing provisions and benefit provisions for them are also of a long-term nature: participation in a pension scheme extends over the whole adult life, either as contributor or beneficiary, i.e. up to 70 years for someone entering the scheme at the age of 16, retiring at the age of 65 and dying some 20 or so years later. During their working years, contributors gradually build entitlement to pensions that will be paid even after their death, to their survivors.

The objective of pension projections is not to forecast the exact progression of a scheme's income and expenditures, but to verify its financial viability. This entails evaluating the scheme with regard to the relative balance between future income and expenditures. This type of evaluation is essential, especially in the case of the Sierra Leone scheme, which has not yet reached its mature stage.

Appendix 3
Distribution of pensioners for the actuarial valuation

Orphans

Age	Female		Male	
	Number	Average amount of pension	Number	Average amount of pension
0				
1				
2				
3				
4				
5				
6				
7				
8	1	582 891	1	582 891
9				
10				
11			2	582 891
12				
13	2	582 891		
14	2	582 891	1	582 891
15	1	582 891	1	582 891
16	3	582 891	5	582 891
17	1	582 891		
18	2	582 891	1	582 891
19	1	582 891	1	582 891
20			2	582 891
21			1	582 891
22			1	582 891
23	1	582 891	2	582 891

Survivors

Age	Female		Male	
	Number	Average amount of pension	Number	Average amount of pension
27	1	696 789		
28				
29				
30				
31				
32	1	738 105		
33				
34				
35				
36	2	771 158		
37				
38				
39	1	795 948		
40				
41				
42	1	820 738		
43	2	829 001		
44	1	837 264		
45				
46				
47	2	862 054		
48				
49				
50	1	886 844		
51				
52	2	903 371		
53				
54				
55	1	928 160		

Old age

Age	Female		Male	
	Number	Average amount of pension	Number	Average amount of pension
55	1	1 136 855	15	384 500
56	1	729 699	59	476 002
57	5	1 928 679	84	460 439
58	4	502 307	37	454 638
59			8	861 679
60	3	4 321 342	23	651 500
61	2	773 847	13	1 688 417
62			1	311 717
63			1	2 932 155
64			1	721 929
65				
66				
67			1	2 190 811
68				
69				
70				