

# **Mozambique**

## **Report to the Government**

### **Actuarial Review of the Civil Servants and State Agents Social Protection System as of 31 December 2011**

**Public Finance, Actuarial and Statistics Services Branch (SOC/PFACTS)  
Social Protection Department  
International Labour Office**

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## Abstract

This report presents the results of the first actuarial valuation of the Civil Servants and State Agents Social Protection System. It includes projections and recommendations.

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**Keywords:** social security and public pensions, actuarial studies, demographic trends, measurement and data on national income, forecasting and simulation: models and applications

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## Executive summary

The effective date of the present actuarial valuation is 31 December 2011. An actuarial valuation relies on a large number of assumptions. Its results are not forecasts or predictions; they present the outcomes if all the assumptions were to come true in the future. The estimates provide guidance for the financing of the scheme and for the planning and management functions. Sensitivity tests give indications of a range of possible actual outcomes.

## Experience of the CSSASPS

As this is the first actuarial valuation of the Civil Servants and State Agents Social Protection System, no reconciliation with previous projections can be included in the report. An overview of the experience since reliable data of key indicators have been available, namely 2003, shows that the average increase in insurable earnings and pension expenditure have been respectively 19 and 21 per cent. During that period, the number of pension recipients has increased from 25,031 to 35,755. Retirement and survivors' pensions represent 99 per cent of all pensions.

## Demographic and macroeconomic trends

The Mozambique population is still relatively young; it is expected to slowly age in the next decades as fertility decreases and longevity improves. The ratio of the working-age population to the old-age population will decrease moderately from 10.3 to 5.0 over the next 60 years. Mozambique has many natural resources and their development is expected to generate sustained economic growth. In such a context, increases in productivity, wages and prices are expected to be substantial as compared to developed countries, but uncertainty and volatility are high. The informal sector is still predominant in the labour market and, as no reliable information on long-term possible structural changes is available, maintenance of the status quo is assumed over the projection period.

The demographic trend is favourable to pension systems using the pay-as-you-go (PAYG) financing method, but this observation may not be applicable to occupational pension systems using a different financing system. PAYG is implicitly the current financing system of CSSASPS, although it is not strictly a social security system. It would be relevant to consider moving towards financing rules generally accepted for occupational pension systems.

## CSSASPS demographic and financial projections

The total number of pensioners is projected to increase significantly in the future, from 35,755 in 2011 to 697,083 in 2071, while at the same time the number of contributors will increase from 221,136 to 1,208,027. As the system is maturing, the ratio of contributors to pensioners will decrease materially from 5.6 to 1.7 over the next 60 years.

Financial projections reveal that the PAYG cost rate is projected to increase from 7.1 per cent in 2012 to 27.9 per cent in 2071. The general average premium of the system (the constant contribution rate necessary to finance all the scheme's benefits over the next 60 years) is 20.9 per cent. This may be compared to the employees' contribution rate of 7.0 per cent. Therefore, the cost supported by the employer will increase substantially. The accrued liabilities at the valuation date are estimated at MT 297,354 million.

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The results of this valuation are subject to uncertainty due to the limitations of the database of the National Direction of Social Protection (DNPS). The situation is expected to improve in the near future with the implementation of computer systems and capacity building of staff. Sensitivity tests indicate the impact of variations of key assumptions on results. The test regarding the evolution of the covered population highlights the impact of the incompleteness of the database regarding the insured population. It shows that the cost of the scheme (expressed as PAYG rates) could be between 15 and 20 per cent higher than under the base scenario.

## **Other issues**

### ***Design and cost issues***

As the results of this actuarial valuation show, the burden of the pension system will increase steadily in the next decades to significant levels (about 30 per cent of payroll). The provisions are analysed with a view to determining the most relevant changes that would keep the cost at a reasonable level while preserving the objectives of income protection at retirement. The discussion is based on the key premise that the CSSASPS is an occupational pension system that the employer uses to attract and retain employees, and its cost is part of total remuneration. The question regarding which part of the total remuneration should be used to finance the pension system is left for stakeholders to debate. A long-term PAYG rate of about 20 per cent is considered reasonable for the purpose of discussing the changes to be made. The space to be left for the private sector to play a role in income protection at retirement is an ancillary consideration that the Government, acting as social policy-maker, would wish to promote.

The current pension formula, providing a pension of 100 per cent after 35 years of service, is among the most generous in the world. The accrual rate is 2.87 per cent while 2 per cent is the typical rate in many countries. This generosity is exacerbated by the pension indexing formula providing revaluation of pensions according to the general salary increase of the insured population. Pension indexing according to price inflation or a combination of price inflation wage increases is more common. Changes to both parameters, the pension formula and the indexing pension formula, may procure a large part of the desirable cost reductions. Besides, because the reference salary equal to the final salary is vulnerable to abuse and undesirable cost redistribution to high earners, it should be modified along with other changes to the pension formula. A common formula refers to the average earnings of the last three years. Transition rules should be designed to avoid any retroactive impact on rights accrued in the past.

Changes in the retirement age should also be addressed in the near future with a view to scheduling them far in advance. Gender equalization is an issue to be addressed in that process. Discussions have been held and suggestions for changes made on the implementation of maximum insurable earnings, the reversion provisions of survivors' pensions and the provisions regarding participants leaving the system before becoming eligible to a retirement pension.

### ***Financial and administrative framework***

The current PAYG financing mechanism does not reflect the government's long-term commitment for the pension system, as it does not recognize the accrued liabilities in the national accounts. This is not consistent with generally accepted accounting practices for occupational pension plans, though funding arrangements of public servants' pension systems can be more flexible than those of the private sector. Whether the existence of a reserve in public pensions systems enhances the security of benefits is a question open to

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debate. Nevertheless, the absence of a fund can be interpreted as a loan made to the Government. Contributors to the pension system may have somehow benefited from that arrangement in their total remuneration agreement.

As the coming surge of the system's cost is likely to put the government capacity to maintain current level of benefits under scrutiny, it is advisable to provide the pension system with an appropriate separate accounting mechanism capable of reporting the costs according to practices that would be closer to full funding. This would provide the better financial information necessary to discuss the balance to be reached between wages and the social protection system in the global remuneration. The creation of a fund may be advisable. A possible approach is presented in this report.

The financial indicators presented in this valuation do not include the impact of administrative expenses, as no recognition of those costs is made in the current accounting process. This is not consistent with generally accepted practices and should be part of the changes in the financial arrangements discussed above. Proper determination of administrative expenses is not straightforward when the employer is the administrator. The creation of a separate entity for the administration of the pension system would make it easier. Such an administrative entity would still require the collaboration of other government entities. A clear distinction in the nature of their services should be made between those normally provided by an employer, such as the remittance of contributions, and those they provide as a supplier to the pension plan administrator, such as the management of computer systems specifically dedicated to the administrative operations.

The scenario of resources pooling with the NSSI deserves investigation. However, it is beyond the scope of this actuarial valuation except for the matter of fund investment. It seems clear that both systems would benefit from some form of operational pooling.

### ***Scope of the system***

The discussion of the respective roles of the CSSASPS and the NSSS is made in reference to the ILO social protection floor, the findings of this valuation and the NSSS valuation, and the premise that well-supervised private collective and individual retirement income protection mechanisms can be desirable for diversification and flexibility.

The vision put forward envisages a multi-pillar system of social security. The first pillar would be a universal non-contributory pension covering all residents. The second pillar would be a contributory social security system covering all workers in the labour force up to modest maximum insurable earnings, and respecting the provisions of the ILO Social Security (Minimum Standards) Convention, 1952 (No. 102). The social security annual pension accrual rate would be set in consideration of both the universal pension and the room to be left for complementary systems to provide retirement income protection, from the first Metical (MT). The CSSASPS would become a complementary system, from the first Metical up to maximum earnings set a level sufficient to cover the full earnings of the majority of its insured population. Collective or individual mechanisms would be available to complement the protection.

Such a structure would allow the social security system to reinforce its foundations while it is benefiting from a favourable demographic pattern. The CSSASPS would be in a better position to move towards accounting and funding rules generally used in occupational pension systems, as the insurable earnings covered by the system would be smaller. That might help the CSSASPS to maintain the objective of income protection as a priority.

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## List of recommendations

1. It is recommended that the stakeholders determine the level of costs of the pension system they can afford and undertake a review of the benefits provisions if the affordable level is lower than the PAYG rate estimated at 27.9 per cent in the last projection year of the base scenario.
2. It is recommended to review the replacement income target of 100 per cent of the last monthly earnings after 35 years of service and the reference salary used in the calculation of the pension formula. The change should not apply retroactively to past contribution years.
3. It is recommended to consider a change in the pension indexing formula and to use the variation of a combination of wages and price indices.
4. It is recommended to equalize the retirement age by sex and coordinate this change with a general increase in the retirement age in the 2020s.
5. It is recommended to limit insurable earnings in order to reduce the risk of redistribution towards high earners.
6. It is recommended to abolish the reversion provisions of the survivors' benefits and redesign the allocation of the initial pensions between eligible persons.
7. It is recommended to reimburse contributions to those leaving the Government before meeting the eligibility requirements to the CSSASPS and the NSSF if applicable.
8. It is recommended to create a separate accounting system for the pension system and to recognize in the national accounts the cost accruals of the Government according to financing rules reflecting long-term costs.
9. It is recommended to analyse the opportunity to create a fund in which the share of employees' contributions not used for the payment of current benefits expenditures would be invested.
10. It is recommended to analyse the opportunity to redesign the CSSASPS, making it complementary to the NSSF.
11. It is recommended that the administrative unit in charge of the operation of the CSSASPS be responsible for the development and maintenance of a database responding to the needs of management and future actuarial valuations.
12. It is recommended that the administrative unit in charge of the operation of the CSSASPS develop an internal actuarial expertise.

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## Abbreviations and acronyms

AIDS	Acquired Immune Deficiency Syndrome
CPI	Consumer Price Index
INE	National Institute of Statistics (Instituto Nacional de Estatística)
CSSASPS	Civil servants and State agents social protection system
DNPS	Direction of Social Protection (Direcção Nacional de Previdência Social)
GAP	General Average Premium
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
ILO	International Labour Office
MIE	Maximum Insurable Earnings
MT	Metical
NSSS	National Social Security System
PAYG	Pay-as-you-go
TFR	Total fertility rate
UN	United Nations



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## Introduction

The Minister of Finances requested the International Labour Office (ILO) to carry out the actuarial valuation of the Civil Servants and State Agents Social Protection System (CSSASPS). The National Direction of Social Protection (DNPS) in the Ministry of Finances administers the system. This is the first actuarial valuation of this system and its effective date is 31 December 2011. The main objectives of this review are to assess the long-term financial sustainability of the CSSASPS and to consider appropriate measures based on the findings. The present report focuses as well on the specific issues raised at the request of the DNPS.

This report has been prepared by the ILO based on the information provided by the DNPS. The Director-General of the ILO appointed Mr. Gilles Binet, Senior Actuary, and Ms. Doan-Trang Phan, Actuary, to complete this actuarial valuation and to prepare the draft of the present report under the general and technical supervision of Mr. Hiroshi Yamabana, ILO Public Finance, Actuarial and Statistics Services Branch (ILO SOC/PFACTS) and with the support of Mr. Nuno Cunha, ILO STEP Programme Coordinator in Mozambique. The actuaries worked in close cooperation with Ms. Alferdina Moiana, Head of Statistics, Economic and Financial Analysis at the DNPS.

Mr. Binet and Ms. Phan were on mission in Maputo from 14 to 26 May 2012 to gather and study statistical data and information on the social security system. A second mission took place from 15 to 22 November 2012 to complete the data collection, clarify certain legal issues, discuss a partial draft report and provide training on the ILO pension model. The model of ILO PFACTS was used to prepare the demographic and financial projections associated with the actuarial review.

Section 1 of the report presents a review of the experience of the CSSASPS. Section 2 describes the projection of the general population and the macroeconomic framework used for the valuation. Section 3 presents the CSSASPS demographic and financial projections on the basis of the present provisions of the scheme. Section 4 analyses different policy issues and administrative practices. The appendices contain a summary of key CSSASPS contribution and benefit provisions, a description of the methodology used for the valuation, key data inputs and assumptions and detailed information on CSSASPS finances for the five-year period ended on 31 December 2011.

The Director-General of the ILO would like to express his appreciation to Mr. Lambo, Director of the DNPS, and to its staff for the cooperation of the institution in providing information and timely support to the actuaries.



## 1. Experience review

This is the first actuarial valuation of the CSSASPS. Therefore, it is not possible to compare recent experience with previous demographic and financial projections, as is the usual practice in actuarial valuations. Nevertheless, it is interesting to have a look at certain statistical and financial data of recent years.

Table 1.1 presents the insurable earnings as well as the contributions paid by civil servants and state agents (7 per cent of basic salary).

**Table 1.1. Insurable earnings and contribution income, 2003–10 (MT thousands)**

Year	Insurable earnings	Employees' contribution
2003	6 900 255	299 999
2004	8 471 407	413 860
2005	9 815 622	420 540
2006	11 780 337	601 294
2007	14 321 975	678 554
2008	17 391 847	777 340
2009	19 209 288	891 740
2010	23 330 299	1 160 951

The average annual salary growth from 2003 to 2010 was 19 per cent. During the period, the average annual increase of state expenditures has been 20 per cent. Civil servants and state agents' salaries represent 24 per cent of those expenditures during the period.

Table 1.2 presents data regarding benefit recipients and expenditures of the CSSAPSS.

**Table 1.2. Statistical data on CSSASPS benefits, 2003–11**

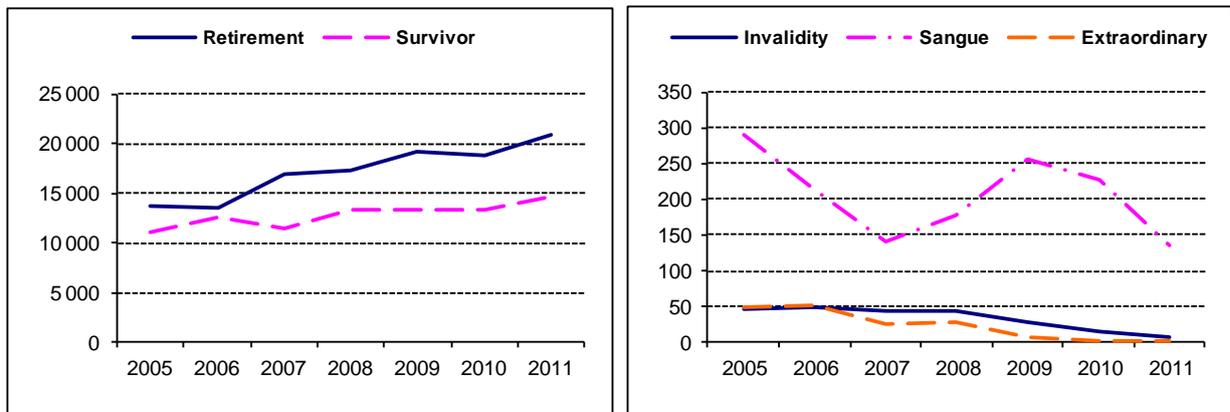
Year	Benefit expenditure (MT thousands)	Number of pensioners
2003	398 096	N/A
2004	436 083	N/A
2005	609 438	25 031
2006	763 404	26 486
2007	946 436	28 604
2008	1 144 703	30 897
2009	1 307 132	32 842
2010	1 534 035	32 449
2011	1 805 997	35 755

The average annual increase in benefit expenditures has been 21 per cent while the number of pensioners has increased on average by 10 per cent.

Figure 1.1 shows the evolution of pensions by category. Retirement and survivors represent the majority of pensioners. Invalidity and "sangué" pensions are mainly work-

related benefits and their volume is consistent with international experience. The number of extraordinary pensions is small and has been declining sharply in recent years. A description of benefits is shown in Appendix 1.

**Figure 1.1. Number of pensioners, by category, 2005–11**



Retirement pensions have grown steadily, while the increase of survivors' pension has been lower. Other pensions have followed a decreasing pattern. The sharp fluctuations in "sangué" pensions are difficult to explain.

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## 2. Projected demographic and macroeconomic environment of Mozambique

The future income and expenditure of the CSSASPS will be closely linked to changes in government expenditure policies, which in turn are influenced by the size and age structure of the population of the country, employment levels, economic and wage growth, inflation, and rates of return on investments. Therefore, in order to estimate future CSSASPS finances, a projection of Mozambique's total population and economic activity is required. Demographic projections provide estimates of the size and composition of the labour force, while projections of the gross domestic product (GDP) and the growth of labour productivity are necessary to project the number of workers and their earnings. Population and economic projections are interrelated. They are thus performed together to ensure consistency of results.

Demographic and macroeconomic variables were projected for a period of 60 years, following an analysis of past trends and an estimate of plausible future experience. Population and economic projections are an intermediary step to derive CSSASPS projections.

### 2.1. Population projection

The determinants of future population changes are fertility, mortality and net migration. Fertility rates determine the number of births, while mortality rates determine how many, and at what ages, people are expected to die. Net migration represents the difference between the number of people who permanently enter and leave Mozambique and is the most volatile of the three factors.

The last official population census took place in 2007, where the resident population was estimated at 20,632,434. Estimations of the population made by the National Institute of Statistics (INE) for the period 2007 to 2060 were used.<sup>1</sup> For the purpose of this valuation, projections for the remaining projection period were made by assuming that the trends of each determinant would remain until 2071. It is noteworthy that INE projections were performed separately for the urban and rural areas.

#### Fertility

The total fertility rate (TFR) represents the average number of children each woman of childbearing age would have if she had all her children in a particular year. If there is no migration, a TFR of 2.1 is required for each generation to replace itself. The TFR in Mozambique is relatively high, at 5.4 in 2011. According to INE projections, it decreases to 3.3 in 2040 and 2.3 in 2060. It has been assumed that it would reach 2.1 in the last projection year (2071).

<sup>1</sup> Detailed results are available for 2007–2040 in Instituto Nacional de Estatística: *Projeções Anuais da População Total Urbana e Rural 2007–2040* (Maputo, 2010).

## Mortality

Life expectancy at birth is low, at 48.8 and 52.9 for males and females respectively in 2007. Improvement of mortality in urban areas for the period 2007 to 2017 is assumed to be equal to the observed improvement in the City of Maputo between 1997 and 2007. For the rural areas, the 2017 mortality has been assumed to be that of urban areas in 2007. INE made projections until 2060 according to different formulae. For the rest of the projection period (2061–71), life expectancy and improvements in mortality are assumed to occur in accordance with UN estimates, taking into consideration the trends in previous years in INE projections.

Deaths due to HIV and AIDS are implicitly considered in the projections. Prevalence is high in Mozambique and affects the economy not only in terms of mortality but also in terms of work absenteeism. Information published in an inquiry on the prevalence of HIV<sup>2</sup> was used by INE to ensure that mortality rates are consistent with the findings of the study.

## Migration

Data on international migration are non-existent in Mozambique. INE has analysed the internal migration phenomenon between the 1997 and 2007 censuses and concluded that international migration was the major factor explaining the mismatch between the expected population and that observed. Net migration is negative in 2007 but very small as a percentage of the total population (less than 0.1 per cent). The population projections presume that the negative international migration observed in 2007 will phase out linearly from 2007 to 2030 and will thereafter remain at zero.

Table 2.1 shows key demographic assumptions for selected projection years.

**Table 2.1. Demographic assumptions, selected years 2011–71**

Year	Total fertility rate	Life expectancy at birth		Net migration
		Males	Females	
2011	5.4	50.3	54.5	-1 770
2021	4.9	54.6	59.0	-842
2031	3.9	60.1	64.7	0
2041	3.2	64.4	69.2	0
2051	2.7	67.0	72.0	0
2061	2.3	69.0	74.1	0
2071	2.1	70.8	75.8	0

## Projected population

Figure 2.1 presents the projected population of Mozambique from 2011 to 2071, separated into three age groups: children (0–15), persons who can potentially contribute to

<sup>2</sup> INSIDA: *Inquerito Nacional de Prevalencia, Riscos Comportamentarios e Informaçao sobre o HIV e SIDA em Mocambique* (Maputo, 2009).

the national insurance scheme (16–59) and persons at pensionable age (60 and over). Although the population is gradually ageing over the projection period, the evolution of the relative size of the age groups indicates that the ageing process is not rapid.

**Figure 2.1. Projected population of Mozambique, by age group, 2011–71**

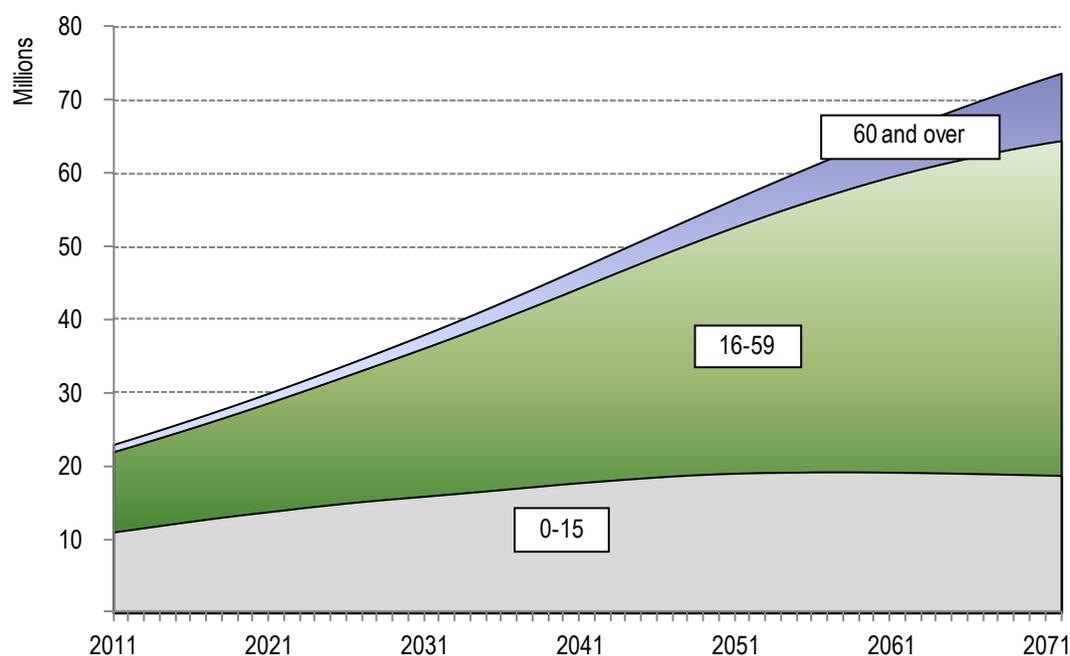


Table 2.2 presents detailed population projections. We may observe that the total population will increase steadily from 23,049,621 in 2011 to 73,113,265 in 2071. The number of persons at pensionable age (60 and over) will grow from 1,072,565 in 2011 to 9,063,961 in 2061. The ratio of persons of working age to those of pensionable age will thus fall from 10.3 to 5.0 over the projection period.

**Table 2.2. Projected population of Mozambique, 2011–71**

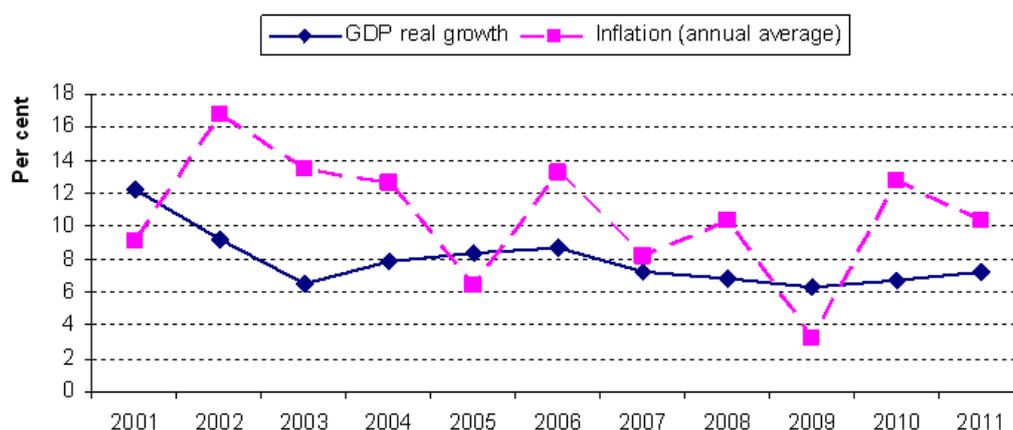
Year	Total	Age			Ratio of persons 16-59 to 60 & over
		0-15	16-59	60 & over	
2011	23 049 621	10 973 767	11 003 289	1 072 565	10.3
2021	30 061 139	13 733 904	14 924 308	1 402 927	10.6
2031	38 063 907	15 833 684	20 286 807	1 943 416	10.4
2041	47 130 044	17 674 909	26 669 708	2 785 428	9.6
2051	56 600 836	18 964 274	33 697 806	3 938 756	8.6
2061	65 441 028	19 106 335	40 372 146	5 962 547	6.8
2071	73 113 265	18 716 700	45 382 604	9 013 961	5.0

## 2.2. Macroeconomic framework

### Economic growth

The Mozambique economy has been growing fast for two decades. In the period 2001–11, the annual GDP growth rate averaged 7.9 per cent. It is expected to remain near 8 per cent over the mid-term on account of activities in natural resources. Figure 2.2 shows that inflation has been high in the period, with an average of 10.5 per cent.

Figure 2.2. Key economic indicators, 2001–11



Mozambique benefits from important natural resources including coal, natural gas, ore deposits, forestry reserves and hydro power generation capabilities. The country's youthful population, reflecting potential for social and economic dynamism, its geographical positioning and economic diversification as well as political stability are also considered strengths and opportunities for Mozambique's economic development. However, the country faces important challenges and weaknesses such as lack of efficiency, corruption, inadequate infrastructure, weak institutional and human capacity and an underdeveloped private sector.<sup>3</sup> Overall, it seems that conditions for long-term sustained economic growth are present in Mozambique, but the framework to ensure that it will materialize into sustainable social development appears to be a work in progress for which the end result is uncertain.

For the present valuation, an expected real GDP growth of near 8 per cent for the mid-term has been considered a reasonable assumption in the economic framework. The long-term GDP growth assumption is the result of assumptions on the future evolution of the labour force, employment and labour productivity. The evolution of the labour force is the result of the population projection and assumptions regarding the participation rates discussed below. Labour productivity has been set to increase from its 2011 level at 4.2 per cent to 4.5 per cent in 2013, which corresponds to 7.6 per cent GDP growth in that year, and remains constant thereafter. Table 2.3 shows the real GDP growth and the increase of the number of workers for selected years.

<sup>3</sup> African Development Bank Group: *Republic of Mozambique: Country Strategic Paper 2011–2015* (Tunis, 2011).

**Table 2.3. Projected GDP growth and total employment, selected years 2011–71 (percentages)**

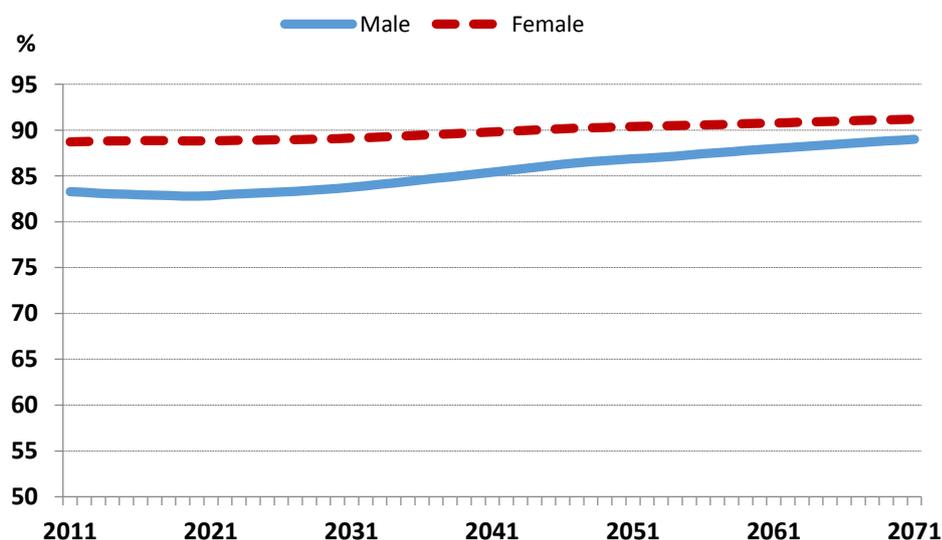
Year	Real GDP growth (%)	Increase in the number of workers (%)
2011	7.2	2.9
2021	7.8	3.2
2031	7.7	3.1
2041	7.4	2.8
2051	7.0	2.4
2061	6.4	1.8
2071	5.8	1.3

## Labour force

Table 2.4 presents the labour market balance over the projection period. Data on labour force and its characteristics have been mainly extracted from the INE report covering the years 2004 and 2005.<sup>4</sup> The ILO database (LABORSTA) has also been used when the required information was not available in the INE report. The concept of unemployment used in the INE report is different from the usual one in that it includes people not employed and not seeking employment at the time of inquiry. Though this approach may be useful for certain studies, it has been necessary for the purpose of this valuation to rearrange the data in order to apply the concept used in the ILO model.

For the future, it is assumed that gender- and age-specific labour participation rates will stay constant at their level of 2004/05 for the entire projection period. Under this scenario, the total participation rate for ages 15–69 increases from 83 to 89 per cent for males and from 89 to 91 per cent for females over the projection period (figure 2.3)

**Figure 2.3. Projected total participation rates, by sex, 2011–71**



<sup>4</sup> National Institute of Statistics: *Inquérito integrado à força de trabalho (IFTRAB 2004/05), Relatório final* (Maputo, 2006).

The age-specific employment rates based on IFTRAB data have been kept constant for each sex during the total projection period. The distribution of the employed population between the salaried and the self-employed stays constant during the period. Salaried workers represent 19.9 per cent of the male employed population, and the corresponding proportion for females is 4.2 per cent. It can be expected that such proportions will increase with the economic development of the country but no study on this issue is available. Due to the particular definition of the employed population in the IFTRAB report, the unemployment rate is determined as a residual item in this projection. The decreasing trend in the unemployment rate is uniquely due to the change in the age composition of the active population.

**Table 2.4. Labour market balance, 2011–71 (in thousands)**

	2011	2021	2031	2041	2056	2071
<b>Total population</b>	<b>23 050</b>	<b>30 061</b>	<b>38 064</b>	<b>47 130</b>	<b>61 138</b>	<b>73 113</b>
Male	11 108	14 550	18 508	22 999	29 914	35 801
Female	11 941	15 511	19 556	24 131	31 224	37 312
<b>Population 15-69</b>	<b>12 173</b>	<b>16 478</b>	<b>22 338</b>	<b>29 335</b>	<b>41 319</b>	<b>51 987</b>
Male	5 709	7 808	10 702	14 175	20 228	25 622
Female	6 464	8 671	11 636	15 160	21 090	26 365
<b>Labour force</b>	<b>10 490</b>	<b>14 167</b>	<b>19 336</b>	<b>25 718</b>	<b>36 782</b>	<b>46 841</b>
Male	4 755	6 467	8 965	12 106	17 682	22 798
Female	5 736	7 701	10 371	13 612	19 101	24 043
<b>Total participation rate</b>	<b>86%</b>	<b>86%</b>	<b>87%</b>	<b>88%</b>	<b>89%</b>	<b>90%</b>
Male	83%	83%	84%	85%	87%	89%
Female	89%	89%	89%	90%	91%	91%
<b>Total employed</b>	<b>9 469</b>	<b>12 777</b>	<b>17 431</b>	<b>23 210</b>	<b>33 381</b>	<b>42 759</b>
Male	4 271	5 797	8 023	10 851	15 950	20 693
Female	5 199	6 980	9 408	12 359	17 431	22 065
<b>Salaried</b>	<b>1 244</b>	<b>1 685</b>	<b>2 317</b>	<b>3 113</b>	<b>4 535</b>	<b>5 852</b>
Male	948	1 287	1 781	2 409	3 541	4 594
Female	296	398	536	704	994	1 258
<b>Self-employed</b>	<b>8 225</b>	<b>11 092</b>	<b>15 114</b>	<b>20 097</b>	<b>28 847</b>	<b>36 907</b>
Male	3 323	4 510	6 242	8 442	12 409	16 099
Female	4 903	6 582	8 872	11 655	16 437	20 808
<b>Unemployed</b>	<b>1 021</b>	<b>1 390</b>	<b>1 905</b>	<b>2 508</b>	<b>3 401</b>	<b>4 082</b>
Male	484	669	942	1 255	1 731	2 105
Female	537	721	963	1 253	1 670	1 977
<b>Unemployment rate</b>	<b>9.7%</b>	<b>9.8%</b>	<b>9.9%</b>	<b>9.8%</b>	<b>9.2%</b>	<b>8.7%</b>
Male	10.2%	10.4%	10.5%	10.4%	9.8%	9.2%
Female	9.4%	9.4%	9.3%	9.2%	8.7%	8.2%

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## Inflation

A large part of inflation in Mozambique is related to the import of commodities. In the context of sustained economic growth, it is expected that it will remain at high levels. Convergence between 5 and 6 per cent is expected. For this valuation, it has been set at 7.2 per cent in 2012 and 5.6 per cent in 2013 and remains constant thereafter.

## Wage increases

The real wage increase is assumed to correspond to the productivity increase per worker, based on the assumption that wages will adjust to the efficiency increase over time. Nominal wage increases will thus fluctuate slightly at around 10.4 per cent over the projection period.

## Interest rate

No fund is set aside at present, as the contribution income flows into the general revenues and benefit payments are made out of it. In order to calculate financial indicators, it is necessary to rely on discount rates to consider the time value of money. For this purpose, it has been assumed that the combination of inflation and a real rate of return of 3 per cent would be appropriate. The long-term nominal rate is 8.8 per cent since inflation is 5.6 per cent. This assumption presumes that assets would be invested in fixed income securities only.

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### **3. CSSASPS demographic and financial projections**

This valuation deals with the ability of the Government 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 by the CSSASPS, thus paying contributions, accruing benefit entitlements and later receiving 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 Section 2 and on the basis of the database and assumptions appearing in Appendix 3.

The main purpose of the valuation is to find out whether the financing of the CSSASPS is on course, and not to forecast numerical values exactly. Due to the long-term nature of the assumptions and the lack of data, absolute figures contain a high degree of uncertainty. Therefore, results should be interpreted carefully; future actuarial reviews undertaken on a regular basis will allow validation of the assumptions in the light of the actual experience.

Pensions are long-term benefits; they will attain a mature state only first generation of contributors have become pensioners and have died and all survivors' pensions paid on their behalf have ceased. This requires that the situation of the scheme be analysed over the next 60 years. The general methodology of the actuarial review is presented in Appendix 2.

#### **3.1. Defining the “base scenario”**

The apparent intention of the CSSASPS is to fully protect those workers with a long career in government against the loss of purchasing power at retirement. The pension formula provides for a pension of 100 per cent of the salary from the month of retirement and the pension is indexed thereafter according to the average increase of salaries awarded to civil servants and state agents.

#### **3.2. Demographic projections**

As shown in table 3.1, the total number of pensioners is projected to increase significantly in the future, from 40,531 in 2012 to 697,083 in 2071, while at the same time the number of contributors will increase from 228,314 to 1,208,027. The ratio of contributors to pensioners will thus decrease from 5.6 to 1.7 over the next 60 years.

**Table 3.1. Projected number of contributors and pensioners, 2012–71**

Year	Number of contributors	Number of pensioners			Total number of pensioners	Ratio of contributors to pensioners
		Retirement	Invalidity	Widows and orphans		
2012	228 314	22 802	12	17 717	40 531	5.6
2013	236 189	24 788	17	20 683	45 489	5.2
2014	244 597	27 012	23	23 748	50 782	4.8
2015	253 307	29 591	28	26 922	56 542	4.5
2016	262 430	32 632	34	30 217	62 884	4.2
2017	271 803	36 242	40	33 645	69 927	3.9
2018	281 922	39 968	46	37 211	77 225	3.7
2019	292 775	43 698	52	40 918	84 668	3.5
2020	304 316	47 278	58	44 769	92 106	3.3
2021	316 646	50 615	65	48 754	99 434	3.2
2026	370 533	64 478	100	67 531	132 109	2.8
2031	437 441	79 584	139	82 621	162 344	2.7
2036	517 034	100 282	183	97 366	197 831	2.6
2041	609 701	127 324	233	113 396	240 953	2.5
2051	825 090	193 000	351	152 029	345 381	2.4
2061	1 033 605	288 184	493	197 524	486 201	2.1
2071	1 208 027	429 880	641	266 562	697 083	1.7

### 3.3. Financial projections

Apart from being driven by the number of beneficiaries, the cost of the CSSASPS is also determined by the average amount of benefits paid to these persons. One indicator of the evolution of pension amounts is the evolution of pension replacement ratios (ratio of the average pension to the average pensionable earnings of active contributors). Table 3.2 presents these replacement ratios for retirement and survivors' pensions.

Retirement pension replacement rates increase over time and tend to stabilize around 0.59 for males and 0.63 for females. A similar pattern is observed for survivors' pensions, where the ratio stabilizes at about 0.32.

**Table 3.2. Projected replacement ratios, by sex, 2012–71**

Year	Retirement		Survivors	
	Males	Females	Widows	Widowers
2012	0.49	0.57	0.23	0.29
2013	0.51	0.58	0.23	0.29
2014	0.52	0.58	0.23	0.29
2015	0.53	0.59	0.23	0.29
2016	0.54	0.60	0.23	0.30
2021	0.56	0.61	0.24	0.30
2031	0.59	0.63	0.26	0.31
2041	0.59	0.63	0.29	0.31
2051	0.59	0.63	0.29	0.31
2061	0.59	0.63	0.30	0.32
2071	0.59	0.63	0.32	0.32

Table 3.3 presents the future evolution of CSSASPS expenditures. It also presents the total expenditure in relation to total earnings (the pay-as-you-go cost rate) and to GDP. The PAYG cost rates are projected to increase from 7.1 per cent in 2012 to 27.9 per cent in 2071 (see figure 3.1). The general average premium (GAP) of the scheme (the constant contribution rate necessary to finance all CSSASPS benefits over the next 60 years) is 20.9 per cent of total earnings.

The share of benefits paid by the general revenues as opposed to those financed by employee's contributions can be expressed as being the difference between the PAYG rate and 7.0 per cent. It is 0.1 per cent in 2012 and increases to 20.9 per cent in 2071. It reaches 7.2 per cent over the next decade or so, by 2023. Then it increases at a moderate pace, to 14.1 per cent over the next 35 years (in 2058) accelerating in the last years of the projection period to 20.9 in 2071.

**Table 3.3. Projected CSSASPS expenditure, 2012–71 (MT millions)**

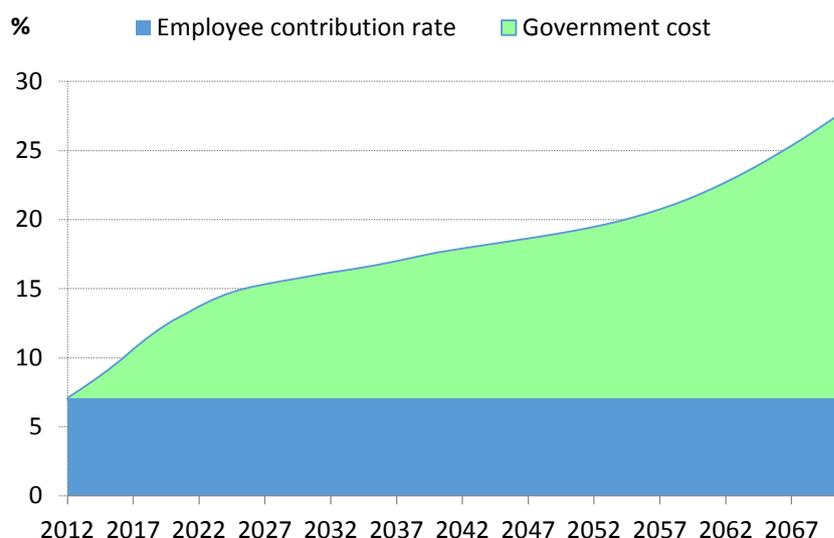
Year	Benefits expenditures				Benefits expenditures as % of	
	Retirement	Invalidity	Survivors	Total	Total earnings	GDP
2012	1 694	1	626	2 321	7.1	0.5
2013	2 079	2	805	2 886	7.7	0.6
2014	2 551	3	1 021	3 575	8.3	0.7
2015	3 140	4	1 284	4 428	9.0	0.7
2016	3 880	6	1 598	5 485	9.8	0.8
2017	4 822	8	1 976	6 806	10.6	0.8
2018	5 929	10	2 426	8 366	11.4	0.9
2019	7 210	13	2 963	10 186	12.1	1.0
2020	8 665	16	3 601	12 282	12.7	1.0
2021	10 291	19	4 358	14 669	13.2	1.1
2026	21 945	49	10 139	32 134	15.1	1.2
2031	44 745	113	20 824	65 682	16.0	1.3
2036	91 908	244	41 806	133 959	16.8	1.4
2041	192 558	509	82 329	275 396	17.7	1.6
2051	799 196	2 074	306 849	1 108 119	19.3	1.8
2061	3 234 161	7 889	1 106 007	4 348 057	22.2	2.2
2071	13 012 485	27 807	4 108 045	17 148 336	27.9	2.7

**Figure 3.1. Projected cost rates as a percentage of total earnings, 2012–71**



Figure 3.2 shows the total PAYG rate in terms of pensionable earnings broken down into two components: the total of employees’ contributions and the government expenditure.

**Figure 3.2. Projected cost rates (as percentage of assessable earnings), 2012–71**



### 3.4. Actuarial liability

Generally speaking, actuarial liability refers to the present value, as of the valuation date, of future payments related to pensions in payment and to the accrued rights of the present participants. For social security systems that are financed on a PAYG basis or that are partially funded, financial indicators based on the actuarial liability concept are not generally used as a tool to define a funding policy. However, they provide useful insight and can help illustrate the financial situation from a particular angle.

Table 3.4 shows the actuarial liability related to pensions in payment at the valuation date. It also presents the relationship between the actuarial liability and the annual benefit expenditure in 2011. The ratio of accrued liability to annual expenditure is high at 37.2. This is mainly due to the fact that the discount rate of 8.8 per cent is smaller than the pension indexing rate based on the salary increase of 10.4 per cent. The corresponding net discount rate is negative at 1.4 per cent ( $1.088/1.104-1$ ).

**Table 3.4. Actuarial liability related to pensions in payment on the valuation date (MT millions)**

A. Actuarial liability related to pensions in payment	67 370
B. Annual benefit expenditure	1 813
Ratio (A / B)	37.2

The discussion of funding mechanisms of the CSSASPS in Section 4 will refer to the actuarial liability under the closed group approach. In addition to the actuarial liability related to pensions in payment at the valuation date, an actuarial liability is determined in relation to the rights of the present insured persons. Under the closed group approach, the latter refers to the present value of all benefits of current participants – those they have accrued at the valuation date and those they will accrue after the valuation date. Under a full-funding financial system, the total of the accumulated fund and the present value of contributions to be made in the remaining career of participants should be equal to the present value of liabilities.

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**Table 3.5. Actuarial liability under the closed group approach (MT millions)**

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A. Actuarial liability related to pensions in payment	67 370
B. Actuarial liability related to current participants	1 014 619
C. Present value of contributions related to current participants	59 705

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Table 3.5 shows that net present value of liabilities is MT 1,022,284 million (A+B-C). Under the full-funding approach, the invested fund would have to be equal to that amount for the plan to be considered solvent. From a prospective point of view, as this fund does not exist, this is the present value of the amount to be paid by the Government to finance the system for the current participants on the theoretical scenario that the plan would continue to exist for current participants. More will be said about this financial indicator in the next section.

Since the CSSASPS could also be considered as a private occupational pension plan, it is interesting to consider another financial indicator generally used to analyse the solvency of private occupational pension plans, namely the accrued liabilities (table 3.6). This actuarial liability refers to pensions accrued at the valuation date. It takes into account the accumulated service of the present insured population, so that insured persons who have accumulated less than 15 years of contributions at the valuation date would not be eligible to a pension under the theoretical scenario of a CSSASPS termination as at the valuation date. Moreover, it is supposed that the amount of pensions accrued at the valuation date will be indexed based on average salary increase after the valuation date.

**Table 3.6. Total liability on the valuation date (MT millions)**

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A. Actuarial liability related to pensions in payment	67 370
B. Accrued liability of current participants	230 484
C. Total liabilities	297 854

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### 3.5. Sensitivity analysis

The projections include an extensive set of demographic, economic and scheme-specific assumptions. Actual experience will inevitably differ from the projections. Furthermore, as the database is incomplete, which generates uncertainty in the determination of certain key assumptions, it is essential to make tests in order to assess the range of reasonable results. This section analyses alternative assumptions regarding (1) the real wage increase; (2) the mortality rate; and (3) the retirement pattern. The impact of alternative scenarios on the GAP is presented.

#### Sensitivity of real wage increase

The results of the valuation are very sensitive to the difference between the assumed future average wage increase and the inflation rate (the real wage increase). Under the base scenario, the real wage increase is 4.5 per cent. The sensitivity test assumes that the rate will start decreasing by 0.25 per cent in 2031 and stabilize at 2 per cent in 2040. Under the sensitivity test, the GAP decreases from 20.9 to 20.0 per cent (table 3.7).

**Table 3.7. Sensitivity test on real wage increase**

Scenario	GAP (% of total earnings)
<b>Base scenario</b> (real wage increase of 4.5%)	20.9
Sensitivity test (real wage increase of 4.5% until 2030, decreasing linearly to 2% in 2040)	20.0

### Sensitivity of mortality rates

Due to the lack of relevant data to assess the mortality experience of CSSASPS participants, the mortality tables used for the base scenario are the same as in the NSSS actuarial valuation. Data indicate that the current mortality of NSSS participants is similar to the projected mortality rates by INE 40 years later: the life expectancy of NSSS participants in 2011 is assumed to be that of the 2051 INE projections for the total population. Without hindsight on the mortality level of participants in the NSSS, theoretical considerations would suggest using the mortality rates by INE for the urban population for the base scenario. However, this would not be appropriate, because mortality rates would be high compared to experience, but it remains interesting to make a sensitivity test to quantify the impact of the assumption. In INE mortality projections, the life expectancy of the urban population in 2011 is that of the 2016 INE projections for the total population. Table 3.8 shows that the estimated GAP would be lower. In pension systems, the higher the mortality, the lower the cost.

**Table 3.8. Sensitivity test on mortality rates**

Scenario (life expectancy in 2011 at age 60)	GAP (% of total earnings)
<b>Base scenario</b> (NSSS participants - male: 17.0, female: 19.7)	20.9
Sensitivity test (urban population - male: 13.8, female: 15.5)	20.0

### Sensitivity of retirement age

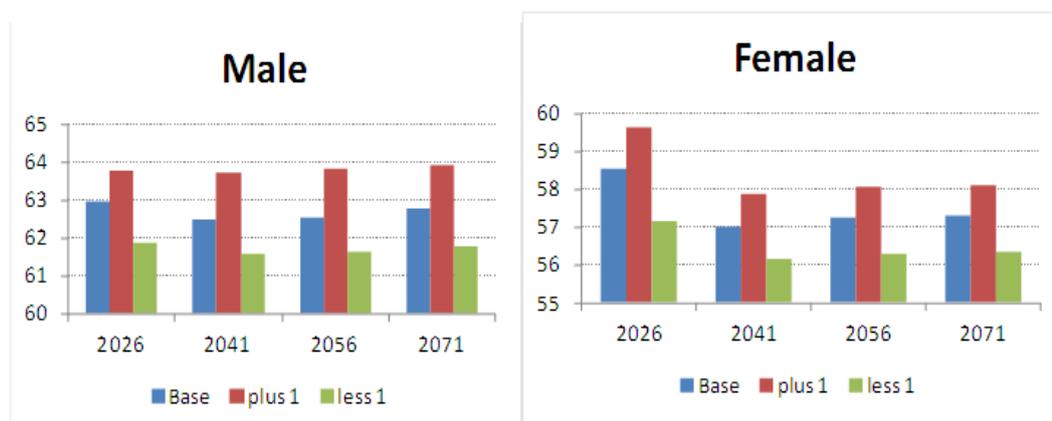
Results of actuarial projections are sensitive to the retirement pattern. Table 3.9 shows the impact of two scenarios. For each of them, the average retirement age is different by approximately one year from that of the base scenario. As the retirement pattern of the base scenario has been developed from an incomplete database, this sensitivity test is useful to illustrate the range of potential results.

**Table 3.9. Sensitivity test on retirement age**

Scenario	GAP (% of total earnings)
Base scenario	20.9
Higher retirement age ( <i>plus 1</i> )	19.4
Lower retirement age ( <i>less 1</i> )	22.4

Figure 3.3 shows the average retirement age corresponding to the scenarios described in table 3.p for selected projection years.

**Figure 3.3. Sensitivity test on average retirement age, selected years 2026–71**



**Sensitivity of coverage rate**

Results of actuarial projections are very sensitive to the evolution of the coverage rate. Even if corrections were made to smooth out irregularities of the coverage rates observed in the base projection year, the pattern of new entrants and those leaving the pension system is not totally consistent with the expected profile of new retirees in terms of number of years of past service. Because of limitations in the statistical data regarding the historical labour force as well as the insured population, it is not possible to fully understand the current pattern and the past trends with a view to reflecting them in future trends, which generates uncertainty. In the attempt to estimate the impact on costs of what might be considered the upper limit of a reasonable range of assumptions, an alternative model of the covered population has been developed. Table 3.10 shows the impact of this scenario.

**Table 3.10. Sensitivity test on the covered population**

Scenario	GAP (% of total earnings)
Base scenario	20.9
Sensitivity test (alternative covered population)	24.9

The GAP of the alternative scenario is significantly higher than that of the base scenario ( $[24.9/20.9-1] = 19$  per cent). This illustrates the need to work on the database in order to produce more detailed information on contributors and to reduce the range of possible results. The long-term financial impact between the two scenarios is not as high as indicated by the GAP. As to the PAYG rate of the last projection year, the difference between the scenarios is smaller than that of the GAP. For the base scenario, the PAYG rate is 27.9 per cent while it is 31.9 per cent for the alternative –a 15 per cent difference ( $[31.9/27.9-1] = 15$  per cent).

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## 4. Policy issues

This section will present the ILO's views on the benefits and cost of the pension system, its desirable financial arrangements and scenarios regarding its future evolution in the social security system. The projections show that the financial burden of the pension system will increase steadily as the system matures. Contributions from workers have so far been sufficient to cover the benefits payments, but the situation will change. It is important to make decisions as soon as possible in order to benefit from the possibility of planning the changes over a sufficient number of years in order to avoid sudden changes causing collective and individual disturbances.

It would not be practical in the scope of this valuation to detail the financial impact of several combinations of scenarios. The results of certain tests requiring limited data processing and modelling development will be presented. They are subject to the same margin of error as those of the base scenario and it is recommended to update them as soon as more reliable and comprehensive information on contributors and pensioners is available.

### 4.1. Design and cost issues

The discussion of the generosity of the CSSASPS has to consider its nature and objectives regarding the protection of retirement income. Even if, in the current context, it plays the role of both a social security system and of an occupational pension system simultaneously, it is appropriate to consider the latter to define its objective of the protection of retirement income. Indeed, the pension system can be seen as part of the remuneration of workers and the employer may wish to use it as a tool to attract and retain workers. If the pension system is to be attractive, its benefits as well as its cost should be properly recognized by all stakeholders for the purpose of discussion of employment conditions. To attain this objective the PAYG approach is not the most appropriate one to report the cost of the system.

This section provides comments on the design elements of the CSSASPS that could be revised without jeopardizing its relevance, as well as the ILO's views regarding the implementation of the most desirable changes. Transitional provisions are of great importance in order to respect the objectives of fairness and equity. An important question to be addressed is the balance between collective and individual responsibility in the retirement income protection framework. The current analysis assumes that collective responsibility will continue to be predominant, but the country development would also benefit from the presence of individual and flexible mechanisms, at least for high-earning workers.

The question as to whether the CSSASPS should provide complete protection, from the first Metical of insurable salary, will be addressed in Section 4.3.

#### 4.1.1. Possible changes to certain benefit provisions

##### Accrual rate

The annual accrual rate of pension is 2.87 per cent of the reference salary used in the pension calculation. After 35 contribution years, the insured is therefore entitled to receive a pension equal to the total salary. Accrual rates higher than 2 per cent are rarely seen, especially when the reference salary corresponds to the last salary. A decrease in the accrual rate should be accompanied by an increase in the maximum number of years of

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contribution. The question as to whether the maximum accrual rate should be less than 100 per cent should be analysed in light of the desire to promote individual responsibility through contribution to another pension system. A change in the accrual rate must take into account other parameters such as the reference salary and the retirement age; these are discussed below.

The impact on costs of a change in the accrual rate is more or less proportional to the change in the accrual rate. For example, a decrease in the annual accrual rate from 2.87 to 2.00 per cent would decrease the PAYG rate in the last projection year from 27.9 to 19.5 per cent.

### Reference salary for pension calculation

The reference salary for the calculation of the retirement pension is an important policy issue regarding income replacement objectives at retirement. Should it aim to protect the level of income close to retirement, or to link the pension to the worker's historical earnings (properly revalued in monetary units of the retirement year)? For typical careers, and given proper calibration of accrual rate, the difference in pension between either approach should not be significant. However, for atypical careers such as those with high salary increases at the end of a career, the difference can be substantial. It is generally recognized that the risk of manipulation or abuse is more present in final earnings than in career earnings formulas.

It is understood that the current rationale is to protect the income at retirement and that stakeholders might be reluctant to look at an alternative formula such as a career average revalued earnings. Whether there is a desire to open this debate or not, the current formula should be revisited in order to minimize the risk of unfairness. The salaries of a minimum number of years should be considered: for example, the last three or the best three years in the last five years, in order to minimize the risk of manipulation.

No major financial impact would result from a change in the reference salary, as the accrual rate should be adjusted in order to meet the income protection objectives for the system.

### Pension indexing

Pensions are indexed annually according to the general salary increase of civil servants and state agents. Thus, pensioners are protected against the loss of purchasing power due to inflation, and benefit from productivity increases of workers. This is a praiseworthy objective, but it goes beyond the basic requirement regarding protection and its cost is important. So far as cost limitation is desirable while maintaining the relevance of the system, the pension indexing base is a parameter for which a change should be considered. Using an index based on price inflation or a combination of price inflation and salary increase are acceptable options.

In the macroeconomic context of the present valuation, indexing according to price inflation rather than general salary increases would have a material impact on costs because the long-term productivity increase is significant, at 4.5 per cent per year. For example, pension indexing based on price inflation would decrease the PAYG rate at the end of the projection period from 27.9 to 18.1 per cent. In a macroeconomic framework with smaller productivity increases, the estimated gain from the change would be reduced.

### Retirement age

In many countries, the reaction to increasing pension costs has been to increase the retirement age. In an exercise aiming at reducing CSSASPS costs, it is normal to wonder about the relevance of modifying this highly important parameter. Even in the absence of

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concern over costs, this provision should be analysed at least from the angle of the disparity between the sexes, which is no longer well accepted in most countries.

In Mozambique, where the demographic transition is still slow, the matter of a retirement age increase does not arise with as much acuteness as in rapidly ageing countries. Certain parameters discussed above offer a better opportunity for cost reductions and better acceptance so long as the transitional measures are smooth. Changes in this parameter are usually spread over a long period and their financial impact is only felt in the very long term. The increase of retirement age in developed countries generally responds to changes in the employment opportunities. As the education level increases, opportunities for work at advanced ages are better and policies supporting the recycling of workers at mid-career help to maintain employability at advanced ages. The opportunity to plan a smooth phasing into a balance shift between working time and retirement time should not be missed.

In public pension systems, the trend in increasing the retirement age is well under way in many countries. Table 4.1 provides information on the retirement ages of public systems in the European Union.<sup>5</sup>

<sup>5</sup> European Commission White Paper, *An agenda for Adequate, Safe and Sustainable Paper*, Brussels, 2012.

**Table 4.1. Retirement ages in public pension schemes in the European Union**

Country	Pension age M/F (2009)	Pension age M/F (2020)	Increase in pension age after 2020, M/F
Austria	65/60	65/61	65/65
Belgium	65/65	65/65	
Bulgaria	63/60	63/61	65/63
Cyprus	65/65	65/65	
Czech Republic	62/60	63y10m/63y8m	65/65
Denmark	65/65	65/65	67+/67+
Estonia	63/61	64/64	65/65
Finland	65/65, 63-68	65/65, 63-68	
France	60-65/60-65	62-67/62-67	
Germany	65/65	65y9m/65y9m	67/67
Greece	65/60	65/65	Life expectancy 69y4m in 2060
Hungary	65/62	64/64	65/65
Ireland	65/65	66/66	68/68
Italy	65/60	66y11m/66y11m	Life expectancy 70y3m in 2060
Latvia	62/62	64.5/64.5	65/65
Lithuania	62y6m/60	64/63	65/65
Luxembourg	65/65	65/65	
Malta	61/60	63/63	65/65
Netherlands	65/65	65/65 (66/66)	65/65 (67/67)
Poland	65/60	65/60 (67/???)	(67/67)
Portugal	65/65	65/65	
Romania	63y4m/58y4m	65/60	65/63
Slovakia	62/57.5-67.5 ( children)	62/62	
Slovenia	63/61	63/61	
Spain	65/65	65/65 (66y4m/66y4m)	67/67
Sweden	61-67	61-67	
United Kingdom	65/60	66/66	68/68

Source: European Commission: *An agenda for adequate, safe and sustainable pensions*, White Paper, COM (2012) 55 final (Brussels, 2012).

An increase in the retirement age is unavoidable in the long term in Mozambique. It is advisable to start discussing this matter now and hopefully to come up with a timetable for increases in the retirement age, even though its application may not affect several cohorts of insured. In principle, gender equalization is an issue that should be addressed in the near future, but it is probably more acceptable to settle on the issue at the same time as the overall retirement age. For example, if the ultimate retirement age is to be 65 for both sexes, the retirement age of men could be increased every year by three months from a given year (for example in 2025), while that of women would increase by six months until both sexes have the same retirement age, 20 years after the start of the increase. An increase in the age at which the normal pension is paid does not mean that workers cannot retire earlier. Early retirement should be available, with appropriate reduction factors ensuring actuarial equivalence between retirement at normal age and at an earlier age.

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Since the CSSASPS is not only an occupational pension system, but also a social security system, any change in the retirement age should be coordinated with that of the National Social Security System (NSSS). Should the nature of the CSSASPS change and veer toward a complementary system, there would be less need to adopt similar rules for both systems.

### Reversion of survivors' pensions

The total amount of pension paid to survivors is 75 per cent of the retirement pension and is distributed among the survivors. When the rights of any survivors terminate because of death or attainment of an age limit, there is no decrease in the total amount paid –it is distributed among the remaining survivors. The consequence is that the same total pension is paid as long as there is a single survivor. It is difficult to design a survivors' pension formula that responds to the composition of all households. The current formula certainly provides good protection to all households, but may create overcompensation or undesirable effects in certain cases. It is recommended to analyse an approach whereby a proportion of the insured's pension would be specified for each category of survivors and the current redistribution of terminated rights eliminated.

The financial impact of changes would not be substantial. Given the lack of detailed information on the composition of the survivors' pension, the cost estimates of change are subject to uncertainty. According to the assumptions used in this valuation, the PAYG rate of the last projection would be reduced by less than one percentage point if the redistribution provision were abolished and appropriate adjustments made to survivors' share of pension at the insured's death.

### Ceiling of insurable earnings

At present the scheme covers the totality of earnings (without ceiling). This is unusual for an occupational pension scheme. The absence of a maximum can have a redistributive effect towards participants with high earnings because of their higher life expectancy. In periods when the rate of contribution is lower than the GAP, the redistribution towards high-earning participants is aggravated. The objective of an occupational contributory pension system is to cover a large part of the needs of a significant proportion of the insured while leaving enough room to allow personal initiative to improve the protection by means of other mechanisms. The question is then the definition of that significant proportion of the insured population.

According to the sample used in the present valuation, the distribution of salaries is very concentrated around the mean. Maximum earnings are about 15 times average earnings. There is enough for the introduction of a ceiling without jeopardizing the protection of the majority of workers. For example, a ceiling of five times average earnings would cover the total earnings of 97 per cent of insured the population. No significant financial impact would result from the implementation of such a ceiling.

### Other issues

When a participant terminates employment before meeting the eligibility conditions for a pension, he/she receives no benefit from the scheme. At best, he/she can transfer his/her rights to the social security system of the private sector (Decree No. 49/2009). When this is not possible for any reason, the worker is left with nothing, despite the fact that he/she has paid 7 per cent of earnings while a civil servant or a state agent. This can be considered unfair. A grant provision consisting of reimbursement of contributions and a reasonable yield should be envisaged.

The cost of this additional benefit is not material.

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### 4.1.2. Possible scenarios

Section 4.1.1 has discussed several aspects of the scheme design that can be addressed in order to keep the cost of the pension system at a level that is commensurate with the Government's ability to pay. As the PAYG financing method has been used so far and the system is not mature, the long-term costs are not reflected in the national accounts. The present actuarial valuation provides information on those long-term costs that can be used as a guideline to determine the Government's long-term commitment. The two most useful indicators are the PAYG rate and the accumulated actuarial deficit under the closed group basis. The trend in the PAYG rate indicates that the long-term cost would be around 30 per cent, while the latter indicates that under no change scenario, the actuarial liabilities for the current participants are about three times GDP.

The stakeholders will have to determine the resources that they want to dedicate to the CSSASPS, bearing in mind that money spent on it is not available for wages, as the ability to pay is limited by the government resources. Even if all stakeholders agreed to dedicate a high proportion of total remuneration to the pension system as a trade-off for lower salaries, there is a risk that taxpayers would focus on the generosity of the pension system whilst not recognizing the trade-off, which would generate public dissatisfaction. Besides, a pension system for civil servants and state agents that is significantly more generous than that of the rest of the labour force can be an obstacle to labour mobility objectives, unless appropriate portability measures are put in place.

Practically, there is a limit on the percentage of the insurable payroll that the Government would accept to allocate to the pension system. One way to set the limit of the employer's contribution rate is through a multiple of the workers' contribution rate. A multiple of 1 is generally considered the lower limit of an acceptable bracket in terms of cost sharing between employers and workers. The upper limit depends upon the specific circumstances of each system, but a multiple of 2 probably represents a widely accepted indicator. Based on this possible range and the workers' contribution rate of 7 per cent, the acceptable long-term cost of the system could be between 14 and 21 per cent of insurable salaries.

Certain tests on the financial impact of combinations of parametrical changes indicate that it is possible to keep the PAYG rate in the last projection year in the bracket indicated above while maintaining an adequate level of protection. The tests are performed on the ground that the parametric changes would be applied in 2015 and would have no retroactive impact. Only future right accruals would be affected. Let us consider the design modification whereby the accrual rate is decreased from 2.87 to 2.00 per cent for contribution years after 2014. The pension for a worker retiring in January 2020 with 35 years of service would be 95.7 per cent of the reference salary ( $100 \text{ per cent} \times 30/35 + 2 \text{ per cent} \times 5$ ). The full impact of the change would be felt in 2050. An equivalent approach could be applied to indexation: for example, the part of the pension acquired before 2015 could be indexed according to the salary increase while the rest would be indexed according to the new formula.

Based on the findings of this valuation, the ILO recommends that the parameters of the system to be modified in order to restrain the cost within limits to be determined by the stakeholders. The contemplated changes should include an increase in the retirement age, starting in the 2020s and phasing in to the ultimate target over an appropriate period of time.

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## 4.2. Financial and administrative framework

The discussion of the financial and administrative framework in this section is limited to the current design of the pension system in Mozambique, without considering any systemic reform that would modify the respective roles of the CSSASPS and NSSS. A scenario contemplating such change will be addressed in Section 4.3.

### 4.2.1. Financial framework

At present, PAYG is the financing system of the CSSASPS and the results of the financial projections of this valuation have been mainly presented under that status quo perspective. Employees' contributions are considered a source of income, and benefits payments as an expense in the national accounts. No fund has been set aside to cover the present value of accrued rights. No separate accounting exists for the pension system. The current legislation does not stipulate a specific contribution rate for the employer.

Under the current PAYG system, employers' contributions are set at a level that is sufficient to cover the excess of benefits payments and administrative expenditures over employees' contributions. They are the balancing item that ensures funds are available to pay benefits. As the employers' contributions will increase every year, this funding system makes the pension system vulnerable to pressures to limit the growth of expenditures and to decision-making at undesirable timing. The PAYG financing mechanism may not be the most convenient for the determination of the government contributions. Other approaches ranging between PAYG and full funding should be analysed.

This report provides certain results useful for analysis under a fully-funded approach. The financial projections indicate that accrued rights at the valuation date are about MT 297,000 million (table 3.6). This is the amount of assets that would be necessary to pay for the benefits of current pensioners and the future pensions of active workers corresponding to their accrued rights at 31 December 2011. On a fully funded basis, this amount would be considered as the deficit for accounting purposes, since no reserve is available. For private occupational pension plans, legislation would require that measures be taken to fund this type of deficit over a certain number of years.

For occupational pension plans of workers in the public sector, flexible financing rules can be applied on the grounds that the public institutions are perennial and can rely on government's power of taxation to respect their financial commitments. The need to maintain assets equal to liabilities for benefits security is not as crucial as in private-sector systems. However, the power of taxation is not unlimited, and the security of benefits promises is generally considered improved with the size of the funded ratio (assets/liabilities).

Transparency and proper allocation of government revenues call for separate accounting of pension systems covering public employees irrespective of their funding method. It may be notional, or the governance objectives can be further pursued through the creation of a fund to be managed by a separate and autonomous entity governed by stakeholders. The fund would receive both employees' and employers' contributions, pay benefits and invest any surplus.

Separate accounting would not meet its objectives without proper reporting of liabilities in accordance with international accounting practices of occupational pension plans. This does not mean that the fund should target a 1:1 ratio for assets/liabilities. The ratio should be set according to criteria defined by the stakeholders.

In social security systems, the funding target is often defined by a multiple of benefit payments, for example three times the benefits payments of the year. For occupational

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pension systems, it is more convenient to set the target as a percentage of accrued liabilities since this information is usually available in the financial statements of the pension scheme. A minimum funding target could be the share of cost that is borne by employees' contributions. For example, if employees bear 50 per cent of the cost, then the ratio of assets to liabilities should be set at 50 per cent. This would ensure that the contributions paid by employees are set aside for the future payment of benefits and not used for other purposes.

Since the CSSASPS has the role of both a social security system and an occupational pension system, full-funding rules would put more pressure on cost containment compared to the social security system of workers in the private sector, which could be considered unfair. A systemic change, consisting in having all workers participate in the social security system, would eliminate this risk. The revised CSSASPS would become a complementary system, to be funded according to occupational pension system rules with proper adjustment for the liability corresponding to the share borne by the Government that would not call for full funding.

Getting the CSSASPS financial reporting and funding arrangements closer to international practices would contribute to reinforce the country's financial credibility, which may become crucial. The transition toward international standards is hard work now, but worth the effort to prevent the more serious problem of the cost borne by general revenues increasing beyond a sustainable level. In order to preserve the labour relationship, the long-term financial burden should be determined along with the Government's financial capacity, and properly allocated to cohorts of workers.

As a first step towards better cost recognition, it is recommended to rely on the financial indications of this report to determine a funding mechanism. The GAP of the base scenario, 20.9 per cent of insurable salaries, will be used to illustrate a possible financing mechanism. The rationale is to properly recognize the emerging costs for the proper governance of funds and to build a fund corresponding to the part of employees' contributions not used to pay for current benefits. It is assumed that a fund would be set up to pay benefits and administrative expenses of the system.

- a) Benefits and administrative expenditures are paid by the fund.
- b) The expenses described in a) are shared by employees and the employer in the following proportions: 33.6 per cent for workers (7.0/20.9) and 66.4 per cent for the employer until the results of the next actuarial valuation are available.
- c) Percentages in b) are revised at each actuarial valuation.
- d) The excess of contributions paid by employees over their share of expenses accumulates into a reserve.

The question as to whether the Government should limit its annual expense to benefits payments or also contribute to the fund growth would require further investigation of public finances and national economic development policy. The question should be examined under the angle of the governance of the pension system, the fund building not being essential so long as the costs are properly accounted for in the national accounts.

It is recommended to report the cost of the pension system with reference to international accounting practices that highlight the accrued liabilities and the assets available to cover them. Table 4.2 provides an illustration of the statement of the financial position. A statement of change in the net assets available for investment and accrued pension benefits is also part of the standard reports.

**Table 4.2. Illustration of simplified statement of financial position**

	31 December 2012	31 December 2011
<b>Net assets available for benefits</b>		
Assets		
Investments	60	51
Liabilities		
Accounts payable	-1	-1
<b>Net assets available for benefits</b>	<b>59</b>	<b>50</b>
<b>Accrued pension benefits and deficit</b>		
Accrued pension benefits	329	300
Deficit	-270	-250
<b>Net accrued pension benefits and deficit</b>	<b>59</b>	<b>50</b>

Had the suggested financing technique been implemented at the start of the system, a fund would have accumulated. It would correspond to the excess of employees' contributions over the share of payments allocated to the employees. This share would have been determined on the basis of the GAP at the onset of the system. The GAP established over a 60-year projection period might have been smaller or higher than the present one, depending on the assumptions used at the initial actuarial valuation. In a typical situation, it would have been smaller and the employees' share of the total cost would have been higher than 33.6 per cent. No fund has accumulated because all money has been used to pay benefits and administrative expenses. The implementation of the proposed approach may raise the question as to whether it would be legitimate for the employer to put into the starting fund an amount equal to that which would have been accumulated.

The use of the GAP as a basis to determine the share of costs between employees and the employer is only partially satisfactory, as the GAP probably underestimates the cost of benefit accruals. The opportunity to use another indicator more consistent with full funding objectives, such as the indicators involving benefit accrual, should be investigated at the next actuarial valuation.

#### **4.2.2. Administrative framework**

The need for expertise in the administration of the pensions system has been well recognized, as the Ministry of Finances has created a department for that purpose. Discussion of the institutional framework is beyond the scope of this actuarial valuation except to the extent that it influences the determination of assumptions. In this actuarial valuation, administrative expenses have not been considered in the financial indicators. Such expenses are borne by the Government from the general revenue, and the implementation of more stringent financial rules aimed at recognizing the full cost of the pension system would require a consideration of the administrative expenses in the financial indicators.

The determination of the full operational cost of the pension system is a challenge, because the value of collaboration required from ministries and agencies should be considered in addition to direct costs that can be more easily identified. Certain services normally provided by an employer administering a pension system, such as the deduction

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of contributions from employees' payroll, should not be included in the pension system costs. However, specific services provided by government agencies, such as the database management, should be included.

The question regarding the best institutional arrangements for the CSSASPS should be analysed in conjunction with the proposed changes in financing rules and the long-term vision of social protection at retirement for the country. In several countries, the size of the public-sector employees' pension system justifies the creation of a specialized autonomous body. The question is then: should it stand on its own, or should it be joined to the existing social security institution in order to benefit from economies of scale? There are advantages in pooling certain services, but because the social security system and the public employees' pension system may have different objectives and strategies, it may be more convenient to have separate front office operations. Pension systems are also subject to different political and labour influences, and separate entities may provide more flexibility. The advantages and disadvantages of maintaining or changing the current framework must be carefully addressed. Nevertheless, it is clear that the investment activities should be pooled in a separate entity if a fund is created.

### **4.3. Scope of the system**

The CSSASPS and the NSSF are currently two systems working side by side. Both systems are mandatory, but the NSSF component of coverage for independent workers has not started yet and will be phased in over an undefined period. Together they aim at covering all workers in the economy. Certain key provisions of the systems such as the retirement age are similar, but others such as the pension formula and the pension indexing practices are different. The objectives in terms of income replacement are obviously not the same. The NSSF is a contributory social security system aiming to provide a decent income at retirement with a significant redistribution mechanism through a minimum pension, while the CSSASPS compensation objectives are more similar to those of an occupational pension system aiming to replace a high proportion of income at retirement. Such differences are reflected in their respective costs.

With regard to the efficiency of social policies, it is legitimate to question the current design of income protection at retirement. Which structure would better achieve the long-term objective of extending the coverage of contributory systems to the total labour force? Transposing the predominant structure in the OECD countries to Mozambique would suggest a scenario under which the social security system would cover all workers and the CSSASPS would be converted into a complementary system.

The ILO promotes a social protection floor which includes as a basic pillar a non-contributory universal pension system at retirement. For the second pillar, ILO Convention No. 102 prescribes the minimum provisions for social security contributory pension systems. This leaves space for the third pillar, composed of collective or individual arrangements.

The non-contributory universal pension system is non-existent in Mozambique. The contributory pension system still covers only a tiny part of the labour force, but the intention is to extend it as much as possible. As the career profile of several workers in the private sector is irregular, the minimum pension provision plays a major role in the social security system and this reduces the need for a universal pension. The CSSASPS provides no minimum pension, as redistribution is generally not an objective in complementary systems.

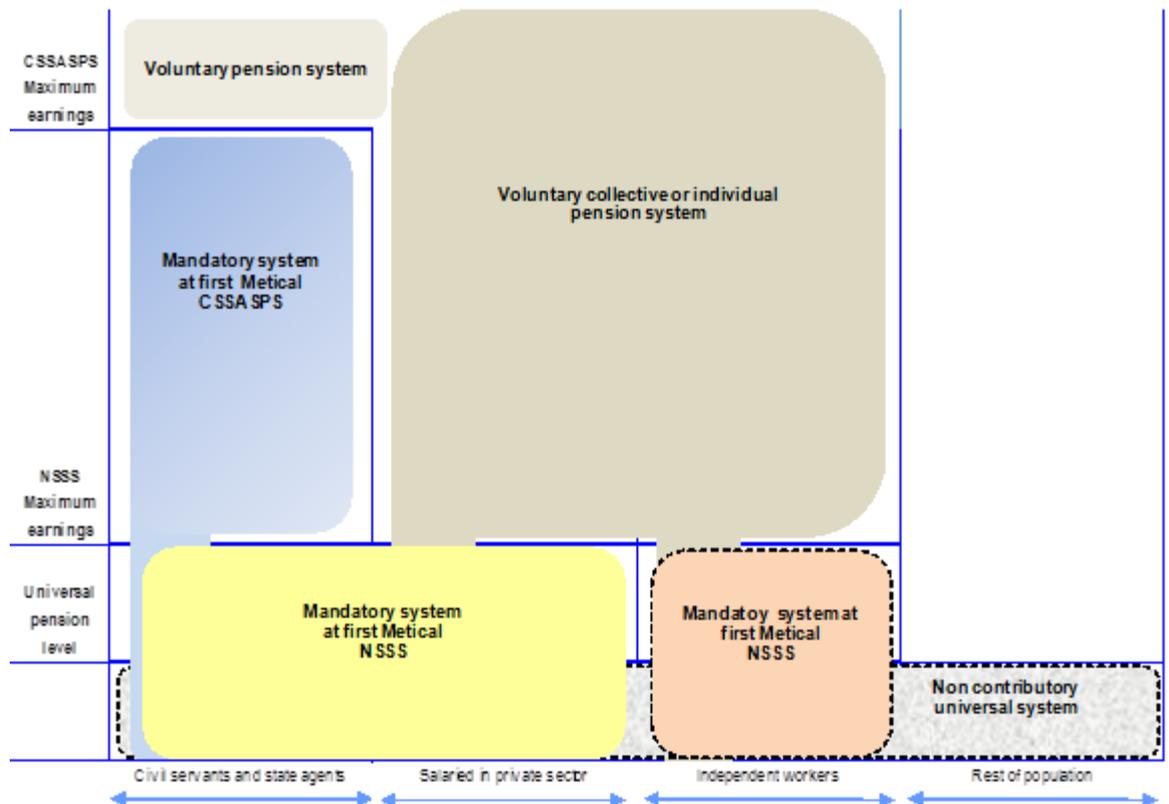
With a view to reinforcing both the social security system and the CSSASPS, the long-term target should clarify the respective roles of the NSSF and the CSSASPS. The

NSSS could apply to all workers, while the CSSASPS could be a complementary pension system for public employees, with both systems covering earnings from the first Metical.

The maximum insurable earnings of the NSSS would be set at a moderate level, and the accrual rate should be determined with a view to providing a decent income replacement rate while respecting the capacity to pay of the contributors. As its financing system is closer to PAYG than to the full-funding system, and the demographic situation is favourable, the progression of the contribution rate to the level required for long-term sustainability can be smooth. It would attain its ultimate level after coverage has stabilized.

The CSSASPS would cover from the first Metical up to a maximum insurable salary set a high level, as discussed previously. The accrual rate above the maximum insurable earnings of the social security system would be set at a level responding to the objectives of income replacement agreed by stakeholders. The accrual rate below the maximum insurable earnings of the social security system would be the difference between the accrual rate above this maximum and the accrual rate of the social security system. The full cost of the system should be reported in the national accounts under the fully funded approach in order to ensure full transparency of the costs of service provided by the Government and to avoid unfair intergenerational transfers. Figure 4.1 illustrates the suggested framework.

**Figure 4.1. Illustration of possible retirement income protection system**



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## Conclusion

The results of actuarial valuations are subject to uncertainty because it is impossible to forecast all variables influencing the cost of pension systems. It is recommended to update them at regular intervals and to develop the actuarial expertise of internal staff in order to increase their involvement in the actuarial valuation process.

The incompleteness of the database has made specific sensitivity tests necessary to estimate the range of uncertainty in the determination of certain key assumptions. The situation is expected to improve in the future as the data suppliers improve their systems.

The results of this actuarial valuation show that the PAYG rate will increase steadily during the projection period to reach 27.9 per cent of insurable earnings in 2071 under the base scenario. The benefit provisions have been analysed with a view to providing guidelines to make changes aiming at limiting the long-term costs. The long-term level of costs should be recognized as part of the global remuneration in the public sector, and accounting rules should be adopted to make it transparent.

The report presents general considerations on the possible future role of the CSSASPS in the retirement income protection system. The considerations highlight the role of the CSSASPS as an occupational pension system used as a work condition to attract and retain employees in the public sector.



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## Appendix I

### Overview of the legal provisions of the social protection system

This appendix provides a general description of the coverage and of the provisions of the social protection system described in Law No. 14/2009 (General Statute of Civil Servants and State Agents).<sup>6</sup> This compulsory social insurance system is administered by the National Department of Social Protection (DNPS)<sup>7</sup> in the Ministry of Finances.

#### **A1.1. Contingencies covered**

The compulsory system covers the following contingencies:

- Old-age: pension
- Invalidity due to work accidents or occupational disease and to certain public assistance activities (defence, natural calamities, life-saving): pension
- Death: death subsidy, survivors' pension and "sangué" pension

#### **A1.2. Coverage**

The compulsory system covers all civil servants and state agents.

#### **A1.3. Contribution base**

The contribution base includes the basic salary and the bonuses with regard to academic profile, management responsibilities, risky, difficult or unhealthy work conditions and other supplements.

#### **A1.4. Financing**

The contribution rate for employees is fixed in the regulation. It is 7 per cent of total earnings. Employees' contributions are considered as a normal source of income for the State. There is no earmarked contribution from the employer. The Government does not maintain a pension fund. The pensions are fully paid from general revenues.

#### **A1.5. Benefit provisions**

##### A1.5.1. Long-term benefits

###### *Retirement pension*

*Eligibility:* To be 55 years old, being a woman, or 60, being a man, and to have 15 years of service, or at any age with 35 years of service. Retirement can be obligatory or voluntary. It is obligatory when the age limit (65 for men and 60

<sup>6</sup> Estatuto Geral dos Funcionários e Agentes do Estado.

<sup>7</sup> Direcção Nacional de Previdência Social.

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for women) or the service limit is reached.

The value of certain years of service can be increased.

*Amount of benefit:* The monthly pension is equal to the ratio of the product of the monthly salary in the retirement month and the number of years of service (maximum 35) and to 35.

*Duration of pension:* The pension is payable for life.

*Minimum basic pension:* No minimum pension.

### *Invalidity pension*

*Definition:* The worker is considered an invalid when he/she has a partial or total loss of earnings capacity.

*Eligibility:* Partial or total loss of earnings capacity due to work accident or occupational disease.

*Amount of benefit:* If the disability is total, the pension formula is equal to the formula of the old-age pension considering that the number of years of service is 35; when the disability is partial, the pension is the sum of both of the following parts: the amount of pension with respect to the effective years of service; and the fraction of the pension with respect to the number of years of service that are missing to reach 35 multiplied by the degree of disability.

*Duration of pension:* The pension is payable for life.

### *Survivors' pension*

*Eligibility:* Death of a retirement or invalidity pensioner or of an active worker if, at the date of the death, he/she has 5 years of service.

The survivors who are entitled are: a) the spouse including the spouse of fact and the divorced or separated spouse with rights to a food pension; b) minor children under 18 and up to 22 or 25 if they are registered in a course of respectively average or top level, or without condition of age if they are totally incapacitated for work and fulfil certain conditions of orphanhood and dependence on parents; c) the ascendancies in certain circumstances.

The pension is paid to the spouse or, in the absence of spouse, according to the provisions of Article 2133 of the Civil Code; when the right of a pensioner terminates, the pension is distributed between the remaining survivors.

*Amount of benefit:* The pension is equal to 75 per cent of the old-age pension or the pension calculated according to the number of years of service at death.

*Duration of benefit:* Spouse: the pension is for life. If he/she remarries, the pension terminates.

Orphan: up to 18, 21 or 25 years if conditions are satisfied.

### *Death subsidy*

*Eligibility:* Death of a pensioner or of an insured.

*Amount of benefit:* The subsidy is equal to 6 times:

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insured: the salary in the month of death

pensioner: the pension payable in the month of death

*“Sanguie” pension*

*Eligibility:* Death of a civil servant or state agent when the death ensues from work accident or occupational disease or disappearance of the worker in the exercise of his/her functions.

*Amount of benefit:* The pension is 100 per cent of the salary in the month of death.

**A1.6. Benefit indexing**

Pensions are increased every year according to the annual variation in the wages of civil servants and state agents.

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## Appendix II

### Methodology of the actuarial valuation

This actuarial review makes use of the comprehensive methodology developed at the ILO Financial and Actuarial Service for reviewing the long-term actuarial and financial status of national pension schemes. These modelling tools include a population model, an economic model, a labour force model, a wage model, a long-term benefits model, a short-term benefits model and an employment injury model. The review has been undertaken by modifying the generic version of the ILO modelling tools to fit the specific case of the CSSASPS.

The actuarial valuation starts with a projection of the future demographic and economic environment of Mozambique. Next, projection factors specifically related to the CSSAPS are determined and used in combination with the demographic/economic framework.

#### ***A2.1. Modelling the demographic and economic environment***

The use of the ILO actuarial projection model requires the development of demographic and economic assumptions related to the general population, the economic growth, the labour 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 such as the maximum insurable earnings and the future level of flat-rate benefits.

The selection of projection assumptions takes into account the recent experience of the CSSAPS to the extent this information was available. The assumptions are selected to reflect long-term trends rather than giving undue weight to recent experience.

##### General population

General population is projected starting with the most current data on the general population, and applying appropriate mortality, fertility and migration assumptions.

##### Economic growth

Increases in the productivity of labour, wage share of GDP and inflation rates are exogenous inputs to the economic model. The long-term GDP growth assumption is the result of assumptions on the future evolution of the labour force, wage share of GDP and labour productivity.

##### Labour force, employment and insured population

The projection of the labour force, i.e. the number of persons available for work, is obtained by applying assumed labour force participation rates to the projected number of persons in the general population. Employment rates are assumed for the future and unemployment is calculated as the difference between labour force and employment. This exercise is performed separately for salaried and self-employed persons.

The model assumes movement of participants between the groups of active and inactive insured persons.

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Based on an allocation of total GDP to capital income and to labour income, a starting average wage is 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 the labour productivity growth. In specific labour market situations, wages might grow at a pace faster or slower than productivity. However, due to the long-term perspective of the present review, the real wage increase is assumed to gradually converge with real labour productivity. It is expected that wages will adjust to efficiency levels over time.

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 within age and sex groups.

## **A2.2. Modelling the financial development of the CSSASPS**

The present actuarial review addresses all revenue and expenditure items of the CSSAPS. The most important components of this budget concern long-term (pension) benefits. This section focuses on them.

For short-term benefits, income and expenditures are projected using simple projection methods based on recent experience.

Projections for pensions are made for each sex separately.

### **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 expenditure 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 to build 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.

### **Pension data and assumptions**

Pension projections require the demographic and macroeconomic frame already described and, in addition, a set of assumptions specific to the CSSAPS.

The database as of the valuation date includes the insured population for the active status, the distribution of insurable wages among contributors, the distribution of contribution months in the valuation year. Data are disaggregated by age and sex. The number of pensioners by age group and sex is available, but not their average pension.

Scheme-specific assumptions such as disability incidence rates and the distribution of retirement by age are determined with reference to the scheme provisions and the aggregate historical experience under the scheme. Due to lack of experience data age and

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sex for these decrements, the determination of assumptions also relies on estimation techniques referring to international experience.

As there is no fund, the determination of the rate of return relies exclusively on theoretical considerations for the base scenario.

### Pension projection approach

Pension projections are performed following a year-by-year cohort methodology. The existing population is aged and gradually replaced by the 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 benefit provisions and financing 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. It is not the objective of pension projections to forecast the exact development of income and expenditures of the scheme, but to check its financial viability. This entails evaluating the scheme with regard to the relative balance between future revenue and expenditure.

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## Appendix III

### CSSASPS specific data and assumptions

In addition to the demographic and economic assumptions presented in Section 2, the projection of the future financial development of the CSSASPS requires a database specific to the scheme (characteristics of insured persons and pensions in payment) and some particular actuarial assumptions. The data used can essentially be grouped in two broad categories. First, there are the data that concern the contributions received and benefits paid and that are used to formulate a number of assumptions. Second, there are the data that allow for identification of the current contributors and benefit recipients and their characteristics, namely the initial data. For this valuation, the data collection system was not sufficiently developed to gather the full set of data. For that reason, the results of this valuation are subject to material uncertainty. Measures such as calibration of initial data with financial statements results and sensitivity tests have been taken to mitigate the impact of data incompleteness.

#### ***A3.1. Data and assumption on the insured population***

Aggregate data on the insured population rely on operational reports of the DNPS. Detailed data by age and sex have been obtained from individual data files for 2010 and 2011. These files do not include all insured persons, but only those from one of the four salary payment systems for civil servants and state agents, namely the e-folha system. They represent about 20 per cent of all insured. Despite its limitations, this set of data remains the best available source of information for the present purpose.

#### Number of insured persons

Table A3.1 shows the average number of insured persons by age and sex in 2011. This average number of contributors is used in the ILO model in combination with density factors (see table A3.4) in order to determine the number of participants who contribute at least once a year. The combination of the average number of contributors and the density factors by age reveals that 181,000 males and 98,000 females would have contributed in 2011.

**Table A3.1. Insured persons, by age and sex, 2011**

Age	Average number of contributors		
	Male	Female	Total
15-19	163	79	242
20-24	3 821	3 459	7 280
25-29	19 038	13 762	32 800
30-34	28 197	19 741	47 938
35-39	23 335	15 324	38 659
40-44	15 723	8 914	24 637
45-49	17 611	8 737	26 348
50-54	14 684	5 874	20 558
55-59	8 420	3 024	11 444
60-64	4 920	1 355	6 275
65-69	4 330	625	4 955
<b>Total</b>	<b>140 242</b>	<b>80 894</b>	<b>221 136</b>

The projection of the insured population is calculated by applying coverage rates (by age and sex) to the employed salaried population as determined under the economic framework below the first retirement age (55 for females and 60 for males). The pattern of coverage rates in the base years shows irregularities in the mid-working ages. They have been smoothed out from 2012 to 2021. Age-specific coverage rates of 2021 are assumed constant for the rest of the projection period. After the first retirement age, the coverage rate is driven by assumptions on retirement age presented in figure A3.2. The coverage rates appearing in table A3.2 are calculated as the ratio of insured persons to the employed salaried people in the labour force at the corresponding age.

**Table A3.2. CSSASPS coverage rates, by age and sex, 2011 and 2071 (percentages)**

Age	2011		2071	
	Male	Female	Male	Female
17	0	0	0	1
22	2	6	4	10
27	14	33	14	32
32	23	58	21	51
37	22	49	25	60
42	16	32	26	58
47	25	50	26	48
52	26	37	24	35
57	19	21	20	25
62	14	13	16	0
<b>Total</b>	<b>15</b>	<b>27</b>	<b>18</b>	<b>32</b>

### Insurable earnings

Table A3.3 shows the average insurable earnings of active contributors in 2011 on a monthly basis, by age and sex. For this purpose, the annual earnings have been divided by 12, but it is known that the annual earnings are paid 13 times. There are two sets of data.

The basic earnings are the basic salary stipulated in the legislation, which constitutes the contribution base. The total earnings are the total remuneration including the basic salary and the bonuses, which constitute the earnings basis for the determination of pension. The model separates the average earnings into three subgroups of earnings: the lowest 30 per cent, a medium range of 40 per cent and the highest 30 per cent, in order to allow analyses regarding lower or upper limits on salaries.

**Table A3.3. Average monthly insurable earnings of active contributors, 2011 (MT)**

Age	Basic earnings		Total earnings	
	Male	Female	Male	Female
15-19	2 082	2 114	2 882	2 819
20-24	3 251	3 558	4 411	5 016
25-29	4 682	4 910	6 954	7 199
30-34	6 175	6 002	9 875	9 003
35-39	7 538	6 827	12 490	10 332
40-44	8 626	7 385	14 298	11 128
45-49	9 241	7 630	14 859	11 299
50-54	9 312	7 554	14 198	10 883
55-59	8 854	7 158	12 575	9 937
60-64	7 835	6 407	10 359	8 524
65-69	6 282	5 235	8 352	6 712
<b>Total</b>	<b>7 325</b>	<b>6 349</b>	<b>11 463</b>	<b>9 399</b>

#### Density of contributions

Density of contribution represents the proportion of the year during which the average contributor pays contributions. Density factors by age and sex were obtained from the individual data. The statistical data presented significant irregularities at young ages because of the small volume of data. Smoothing techniques could not reproduce a satisfactory pattern and a minimum factor of 60 per cent was used. Density factors for selected ages are presented in table A3.4.

**Table A3.4. Density factors, by age and sex**

Age	Male	Female
17	0.60	0.60
22	0.60	0.60
27	0.69	0.71
32	0.76	0.82
37	0.80	0.88
42	0.82	0.91
47	0.82	0.92
52	0.81	0.92
57	0.80	0.91
62	0.80	0.90

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## Accrued past credits

No information was available regarding the past credits of insured people. A theoretical pattern based on 2011 density factors and on assumptions regarding entry age has been developed. Average data are shown in table A3.5. The results for the first projection years are highly sensitive to these assumptions. Sensitivity tests have been conducted and the pattern is considered reasonable on the grounds of continuity with the previous experience.

**Table A3.5. Average past contribution years of insured persons, as of 31 December 2011**

Age	Active insured persons	
	Male	Female
17	1.0	1.0
22	1.2	1.2
27	2.4	2.4
32	4.1	4.3
37	6.6	7.1
42	10.3	11.2
47	14.4	15.8
52	18.5	20.4
57	22.5	24.9
62	26.5	29.4

## **A3.2. Demographic assumptions related to the scheme**

### Mortality of insured persons

There is no reliable data information to accurately determine the level of mortality of contributors and pensioners for the CSSASPS. However, it seems clear from the National Social Security System (NSSS) set of data that it is materially lower than that of the general population mortality. It has been considered appropriate to use the same mortality rates as for the NSSS actuarial valuation. Therefore, mortality rates of the general population have been used with a 40-year set-forward. Sample mortality rates are presented in table A3.6.

Mortality rates are assumed to decline continuously during the projection period in line with the assumed increase in average life expectancy. This mortality pattern is also used to project survivors' benefits payable on the death of insured persons or pensioners. For invalidity pensioners, it is assumed that mortality rates are equal to five times those of the insured population at age 20 years, decreasing gradually to two times at age 60 years.

As the mortality of the insured population seems to be very different from that of the urban population, sensitivity tests have been made in order to estimate the impact of alternative assumption of mortality patterns.

**Table A3.6. Sample mortality rates, by age and sex (per 100)**

Age	Male		Female	
	2011	2071	2011	2071
0	4.426	3.630	0.482	0.498
5	0.112	0.088	0.026	0.026
10	0.060	0.041	0.004	0.006
15	0.081	0.044	0.033	0.020
20	0.121	0.067	0.076	0.030
25	0.153	0.091	0.100	0.037
30	0.184	0.115	0.094	0.044
35	0.236	0.148	0.100	0.060
40	0.330	0.207	0.149	0.092
45	0.489	0.307	0.226	0.142
50	0.750	0.476	0.413	0.229
55	1.164	0.755	0.614	0.336
60	1.814	1.205	0.955	0.521
65	2.823	1.926	1.513	0.810
70	4.373	3.071	2.396	1.388
75	6.715	4.867	4.290	2.616
80	10.181	7.632	7.478	5.092
85	15.146	11.775	12.311	9.324
90	21.942	17.736	19.211	15.886
95	30.685	25.833	28.071	24.738
100	100.000	100.000	100.000	100.000

### Work-related invalidity incidence

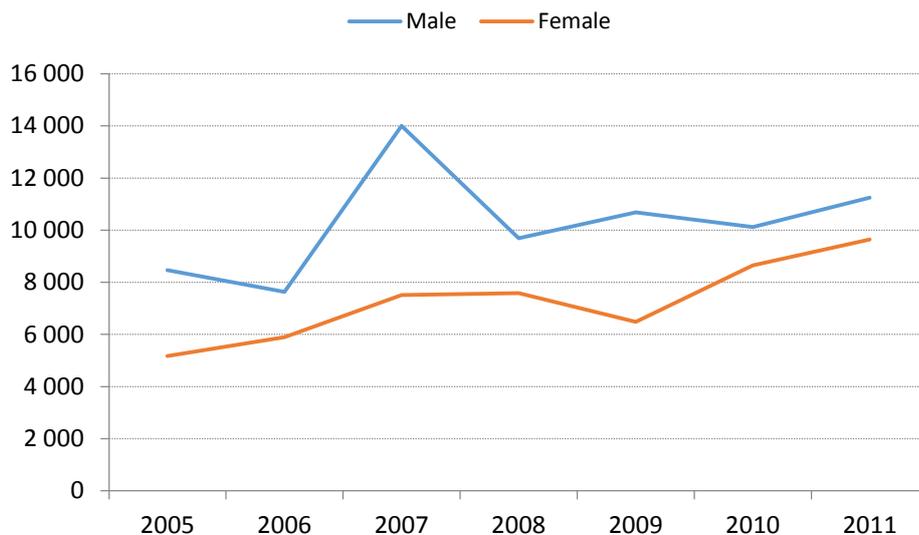
The number of benefit recipients has decreased from 47 in 2005 to 7 in 2011. No information on new cases is available in the database. Considering the size of the insured population, the number of cases at the valuation date is very low relative to other international references. An explanation may be found by exploring along the following lines: misclassification of pensions, very low incidence rates, high recovery rates and high mortality rates. For this valuation, the incidence rate has been set at 5 per 100,000 insured at all ages below retirement age for both sexes.

### Retirement behaviour

The first possible age of retirement under the scheme is 55 years for females and 60 for males. The actuarial model generally considers retirement as the residual element of a series of factors. The macroeconomic framework described in the previous section provides the number of people employed each year. The difference between the number of insured at given age (at which retirement is possible under the CSSASPS) in a given year and the number of insured one year younger in the previous year is considered to be the number of new retirees

The database does not include enough information to identify the pattern of past retirement at specific ages. As illustrated in figure A3.1, the trend of retirement pensions has been irregular since 2005, but it seems more stable in recent years.

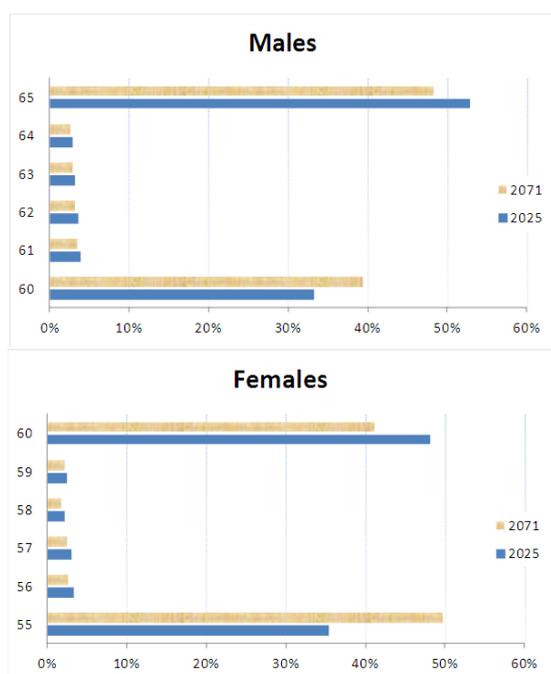
**Figure A3.1. Number of retirement pensions, 2005–11**



The database does not include information that would support the determination of a retirement pattern by age. Taking into consideration the distribution by age of both the insured people and the retirement pensions, retirement rates have been designed in such a manner that the distribution of new retirees would converge over 15 years towards a bimodal distribution that peaks at the first age at which retirement is possible for most career profiles (55 for females and 60 for males) and five years later. This pattern remains thereafter stable for the rest of the projection period. Figure A3.2 illustrates the pattern for selected years.

As the set of retirement rates used for the base scenario is more theoretical than empirical, sensitivity tests have been conducted.

**Figure A3.2. Distribution of new retirement pensions (percentages)**



## Family structure

Information on the family structure of the insured 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 the spouse, the average number of children possibly eligible to an orphan's benefit and the average age of the orphans. These assumptions have been developed for the actuarial valuation of the NSSS and are considered appropriate in the absence of data from the CSSASPS. Sample assumptions are shown in table A3.7.

**Table A3.7. Family statistics**

Age	Male				Female			
	Probability of having an eligible spouse (%)	Average age of spouse	Average number of eligible children	Average age of children	Probability of having an eligible spouse (%)	Average age of spouse	Average number of eligible children	Average age of children
17	16	17	0	0	16	17	0	0
22	24	22	0.3	4	24	22	0.1	4
27	37	25	0.7	6	45	30	0.3	7
32	49	28	0.9	8	60	38	0.5	9
37	59	31	1.2	9	69	46	0.6	11
42	67	35	1.4	10	69	53	0.7	13
47	70	38	1.6	11	69	59	0.7	13
52	73	42	1.7	12	69	65	0.8	14
57	75	45	1.8	13	69	71	0.8	14
62	77	49	1.8	14	69	77	0.8	14
67	79	53	1.9	14	69	82	0	0
72	80	58	0	0	69	88	0	0
77	82	62	0	0	69	93	0	0
82	83	67	0	0	69	98	0	0
87	83	71	0	0	69	99	0	0

## "Sangue" benefits

The number of benefit recipients has been volatile, fluctuating between 135 and 291 from 2005 to 2011. No information on the insured people dying in circumstances making their survivors eligible to this benefit is available in the database. The incidence rates have been determined by trial and error, with the target of maintaining a stable stock of pensioners. For this valuation, it has been assumed that 0.2 per cent of deaths among active males and 1 per cent from active females would eligible to sangue pensions.

### **A3.4. Other assumptions**

#### Indexing of pensions in payment

Pensions in payment are increased annually by the average salary increase of civil servants and state agents.

## Administrative expenses

For this valuation, no administrative expenses have been considered. Generally accepted actuarial practices recommend the inclusions of administrative expenditures in the cost of pension systems. It is understood that future actuarial valuations should include this cost component.

### A3.5. Pensions in payment in December 2011

Aggregate data on the number of pensioners have been prepared by the DNPS. No information on the average amount of pensions is available. For the purpose of the financial projections, the total amount of benefits has been distributed uniformly by age and sex. The level of average pensions by benefit type has been estimated from projections of future pensions. Thus, the average surviving spouse and orphans' pensions were assumed respectively at 50 and 25 per cent of the retirement pensions. In tables A.3.8–12, the age groups have been defined by DNPS in its data transmittal.

**Table A3.8. Retirement pensions**

Age	Male		Female		Total	
	Number	Average annual pension *	Number	Average annual pension *	Number	Average annual pension *
49-54	2 078	64 901	2 316	64 901	4 394	64 901
55-59	2 291	64 901	2 430	64 901	4 721	64 901
60-65	2 551	64 901	2 347	64 901	4 898	64 901
>65	4 325	64 901	2 552	64 901	6 877	64 901
<b>Total</b>	<b>11 245</b>	<b>64 901</b>	<b>9 645</b>	<b>64 901</b>	<b>20 890</b>	<b>64 901</b>

\*Estimates.

**Table A3.9. Invalidity and extraordinary pensions**

Age	Male		Female		Total	
	Number	Average annual pension *	Number	Average annual pension *	Number	Average annual pension *
<38			-		-	
38-41			5		5	
42-48	-		-		-	
49-54	2		1		3	
55-59	-		-		-	
60-65	-		-		-	
>65	-		-		-	

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<b>Total</b>	<b>2</b>	<b>6</b>	<b>8</b>
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\*Estimates.

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**Table A3.10. Widows' and widowers' pensions** (according to sex of deceased)

Age	Male		Female		Total	
	Number	Average annual pension *	Number	Average annual pension *	Number	Average annual pension *
18-25	210	32 451	222	32 451	432	32 451
26-31	687	32 451	523	32 451	1 210	32 451
32-37	1 162	32 451	616	32 451	1 778	32 451
38-41	1 523	32 451	820	32 451	2 343	32 451
42-48	1 513	32 451	853	32 451	2 366	32 451
49-54	526	32 451	350	32 451	876	32 451
55-59	766	32 451	470	32 451	1 236	32 451
60-65	635	32 451	360	32 451	995	32 451
>65	940	32 451	635	32 451	1 575	32 451
<b>Total</b>	<b>7 962</b>	<b>32 451</b>	<b>4 849</b>	<b>32 451</b>	<b>12 811</b>	<b>32 451</b>

\*Estimates.

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**Table A3.11. Children's pensions**

Age	Number	Average annual pension *
<18	1 356	16 225
18-25	555	16 225
<b>Total</b>	<b>1 911</b>	<b>16 225</b>

\*Estimates.

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The average amount of pension has been set at 1.33 times the ordinary pensions of widows and orphans.

**Table A3.12. "Sangue" pensions**

Age	Male		Female		Total	
	Number	Average annual pension *	Number	Average annual pension *	Number	Average annual pension *
<18	5	21 580	3	21 580	8	21 580
18-25	-	-	-	-	-	-
26-31	3	43 159	5	43 159	8	43 159
32-37	-	-	2	43 159	2	43 159
38-41	3	43 159	7	43 159	10	43 159
42-48	5	43 159	3	43 159	8	43 159
49-54	5	43 159	3	43 159	8	43 159
55-59	75	43 159	-	-	75	43 159
60-65	4	43 159	-	-	4	43 159
>65	2	43 159	10	43 159	12	43 159
<b>Total</b>	<b>102</b>	<b>43 159</b>	<b>33</b>	<b>43 159</b>	<b>135</b>	<b>43 159</b>

\*Estimates.