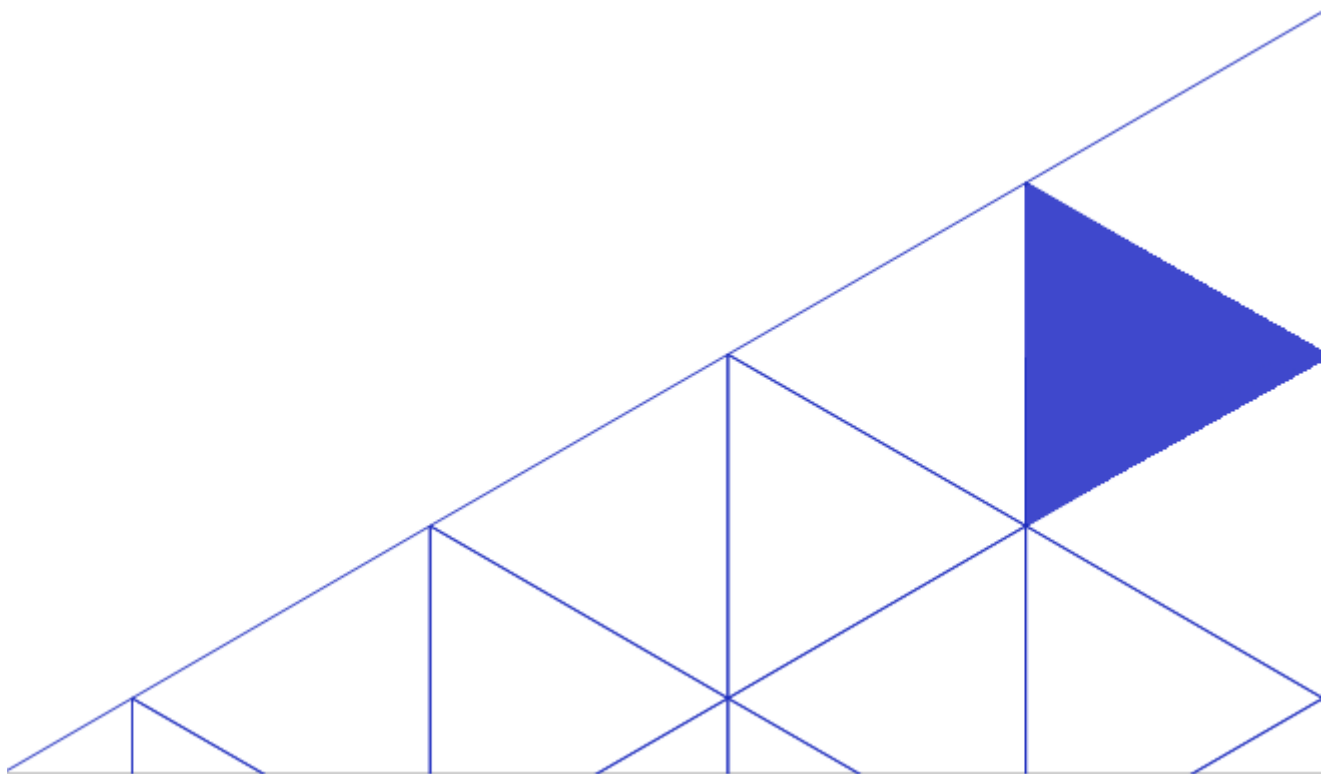International Labour Organization

Republic of Cyprus

▶Report to the Government

**Actuarial valuation of the General
Social Insurance Scheme
as of 31 December 2020**

▶ **Republic of Cyprus. Actuarial valuation of the General
Social Insurance Scheme**

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▶ Foreword

At the request of the Government of Cyprus, the Actuarial Services Unit of the Universal Social Protection Department of the International Labour Office (ILO) agreed to undertake the triennial actuarial valuation of the Cyprus General Social Insurance Scheme as at 31 December 2020. The above agreement is part of long-lasting technical cooperation between the ILO and the Cyprus Government in the area of social security actuarial reviews.

Regular actuarial valuations of national social security schemes play a central role in assessing their financial sustainability.

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Mr Yiannis Panayiotou
Minister of Labour and
Social Insurance
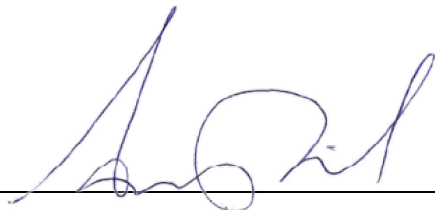
January 2024

Dear Minister,
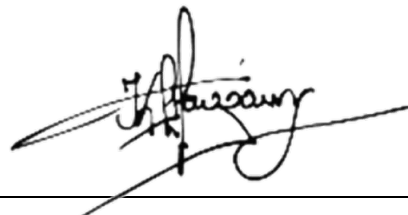
We have the honour to present to you the triennial Actuarial Report of the Social Insurance Scheme, prepared as at 31 December, 2020 in accordance with article 76 of the Social Insurance Law.

Respectfully submitted,

On behalf of the ILO:

André Picard FSA, FCIA

Costas Stavrakis FIA, FCAA

Pierre Plamondon, FSA, FCIA

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▶ Executive summary

In accordance with section 76(2) of the Social Insurance Law of Cyprus, this report presents the results of the actuarial valuation of the General Social Insurance Scheme (GSIS) as at 31 December 2020. It describes the current and projected financial status of the GSIS until 2080 and makes recommendations on its financial governance.

The results presented in this report confirm that the major legislative amendments introduced by the social insurance reforms of 2009 and 2012 can ensure the financial sustainability of the GSIS over the long term.

Financial status of the different benefit branches

Unemployment benefit

Unemployment benefits have experienced important variations over recent years. Prior to the economic crisis (2005-2008), they remained below the income from contributions currently allocated to the Unemployment Account. During the economic crisis (2009-2013) when exceptionally high unemployment rates were observed, benefit expenditures increased significantly and created important deficits in the Unemployment Account. A strong downward trend in expenditure is observed since 2014 in line with the reduction of the unemployment rate, which resulted in a gradual improvement of the financial position of the Unemployment Account and the appearance of annual surpluses since 2017. One exception is year 2020 where additional benefits were granted to unemployed persons to moderate the impact of the COVID-19 pandemic.

Given the recent experience of expenditure on unemployment benefits, it is recommended to leave unchanged the current contribution rate of 1.15 per cent of the insurable earnings of employed persons, but it is vital that the financial position of the Unemployment Account be monitored closely and on a regular basis, so that, where necessary, corrective measures are taken in a timely manner.

Other short-term and employment injury benefits

The branch of "other short-term and employment injury benefits", which includes sickness, maternity and employment injury, has not experienced major variations in its expenditures since the last actuarial valuation, reaching to annual surpluses. It is recommended to keep the current contribution rate of 1.15 per cent of insurable earnings unchanged.

Long-term benefits

The cost of long-term benefits is projected to increase in the future as a result of the ageing of the population and the consequent decrease in the ratio of contributors to pensions. However, during each year of the projection period, the total of contributions and investment earnings is sufficient to meet the GSIS annual expenditure. Hence the adopted schedule of contribution rates is sufficient to ensure the long-term sustainability of the GSIS.

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Concerning the future evolution of the reserve for long-term benefits:

- Over the period 2021–2045, there is an upward trend in the reserve ratio, primarily due to the increased income from contributions, resulting from favourable demographics (high migration) and positive economic developments

- Over the period 2045-2060, the reserve ratio is projected to remain relatively stable, averaging 5.7, primarily due to the impact of the automatic adjustment mechanism of linking the statutory pensionable age with the evolution of life expectancy.

- From 2060 onwards, the reserve ratio starts to gradually decrease, from 5.1 in 2060 to 3.0 in 2080, primarily due to demographic prolonged pressures.

Investment policy

To enhance the financial governance of the GSIS, the security of GSIS members' benefits and intergenerational equity, it is recommended to revise the current investment policy of the GSIS.

A diversification of the investment portfolio of the GSIS into non-government securities should be contemplated in order to increase the rates of return through these diversified investments. In addition, investing, in the near future, part of GSIS reserves in non-government assets would help in the containment of longer-term future increases in government debt towards the GSIS and provide more flexibility to the GSIS in periods of significant economic difficulties. The GSIS could then draw on these funds, if necessary, from any of the GSIS borrowers and not necessarily from the Government, which might itself face cash flow problems at the same time.

Any change in the current investment policy of the GSIS should be gradual, and the exact amounts from future GSIS surpluses to be invested in non-government securities each year should be decided in close cooperation with the Minister of Finance, who according to the Social Insurance Law is currently responsible for setting up the investment policy of the GSIS, while considering the government's budgetary position.

Financing policy

It is recommended that the Government establishes a written financing policy. The financing policy establishes a series of rules applying to contributions and/or benefits to ensure that social security benefits will be funded in an equitable and sustainable manner.

The financing policy would define financing objectives and time horizons, assess current and future financial risks faced by the GSIS and the uncertainty of results, as well as make the necessary provisions to ensure maintaining adequate reserve levels to attain the stability of the financing on a long-term basis.

Uncertainty of results

Tests were performed on the results of the actuarial valuation to measure their sensitivity to changes in key assumptions, namely fertility, mortality, net migration, female labour force participation rates and rate of return on GSIS assets. These tests show that, even though the projected financial status of the GSIS is sensitive to those assumptions, the long-term impact of such changes is relatively small.

In addition to the sensitivity tests, an adverse scenario was performed on the results of the actuarial valuation to examine their sensitivity to changes in the case of unfavourable changes in both demographic and economic assumptions. The adverse scenario shows that, even though the projected

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financial status of the GSIS is sensitive to those changes, the reserve remains constantly positive while the ratio of the reserve over annual expenditure reaches 1.3 in 2080.

► 1.   Introduction

The present actuarial valuation report of the Cyprus General Social Insurance Scheme (GSIS) has been carried out in compliance with the provisions of section 76 of the Social Insurance Law No. 59(I)/2010. It presents the financial situation of the GSIS as at 31 December 2020. The previous actuarial valuation presented the financial situation of the GSIS as at 31 December 2017.

1.1.   Aims of the actuarial valuation

In accordance with section 76(2) of the Social Insurance Law, the main aims of this valuation are to:

1. Review the current and projected financial situation of the GSIS as at 31 December 2020.

2. Assess the long-term financial viability of the GSIS, assuming the legislation remains unchanged, and make recommendations on its financial governance.

3. Assess the sensitivity of the long-term projected financial position of the GSIS to changes in demographic and economic environments.

1.2.   Scope of the report

Section 2 gives a general overview of the methodology used in producing the actuarial projection estimates included in this report, which are based on demographic and economic assumptions described in Section 3. The actuarial projection results are presented in Section 4. Section 5 presents the reconciliation of the results with those presented in the previous actuarial valuation, whereas Section 6 provides a sensitivity analysis on the projection results of key assumptions, along with the results of an adverse scenario. Finally, Section 7 presents general conclusions about the financial position of the GSIS, while Section 8 provides the actuarial opinion.

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▶ 2. Projected methodology

2.1. Methodologies applied

The actuarial valuation of the GSIS involves projections of its revenue and expenditures over a long period to be able to estimate changes in the reserve, which varies from one year to the next as a function of the difference between the GSIS revenue and expenditures. The actuarial projections in this report are based on the current legal provisions of the GSIS, data regarding the starting point for the projections including data on the GSIS contributors and pensioners, and assumptions regarding future demographic and economic developments.

Figure 2.1 shows graphically the general methodology used in this actuarial valuation. Details of that methodology are provided in Annex 2.

▶ **Figure 2.1. General methodology**
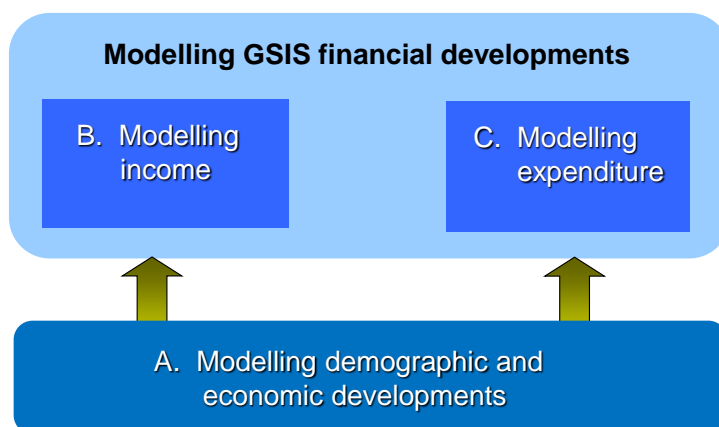
Figure 2.2 presents graphically the methodology used for calculating GSIS revenue from contributions, while figure 2.3 shows the methodology used for calculating GSIS pension expenditure.

The valuation starts with a projection of the general population of Cyprus. The projected population, based on the number of persons in each age group, serves to determine both the working population which contributes to the GSIS and the population eligible for the GSIS various benefits.

The revenue of the GSIS includes both contributions and investment income. For each year in the projection period, total contributions are derived from the total insurance earnings and the contribution rate prescribed by law. The total amount of insurable earnings is estimated from the projected rates of participation in the GSIS and the future level of insurable earnings. Investment income is based on assumptions concerning the rates of return on investments for different types of investment.

Expenditures include the pension benefits paid out, which are projected using assumptions based on the population's eligibility rates for the various benefits, the probability of the occurrence of an event giving entitlement to a pension and the historical record of contributors' insurable earnings.

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▶ **Figure 2.2. Methodology: GSIS contribution income**
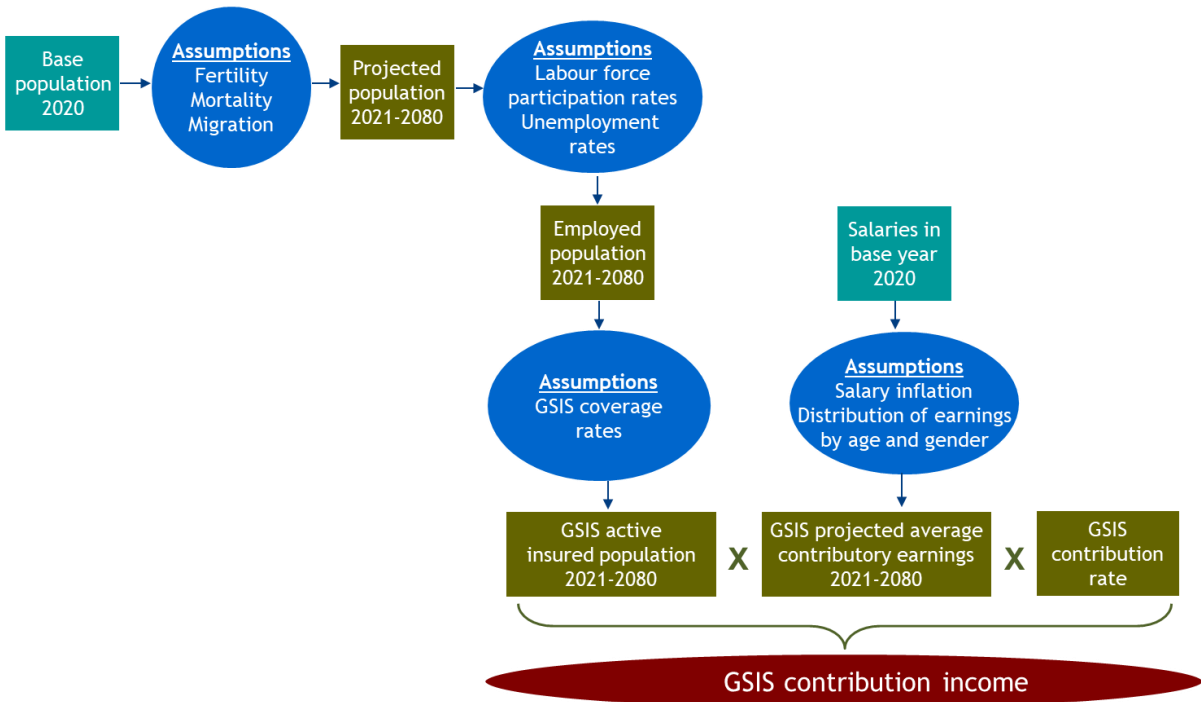
▶ **Figure 2.3. Methodology: GSIS pension benefits**

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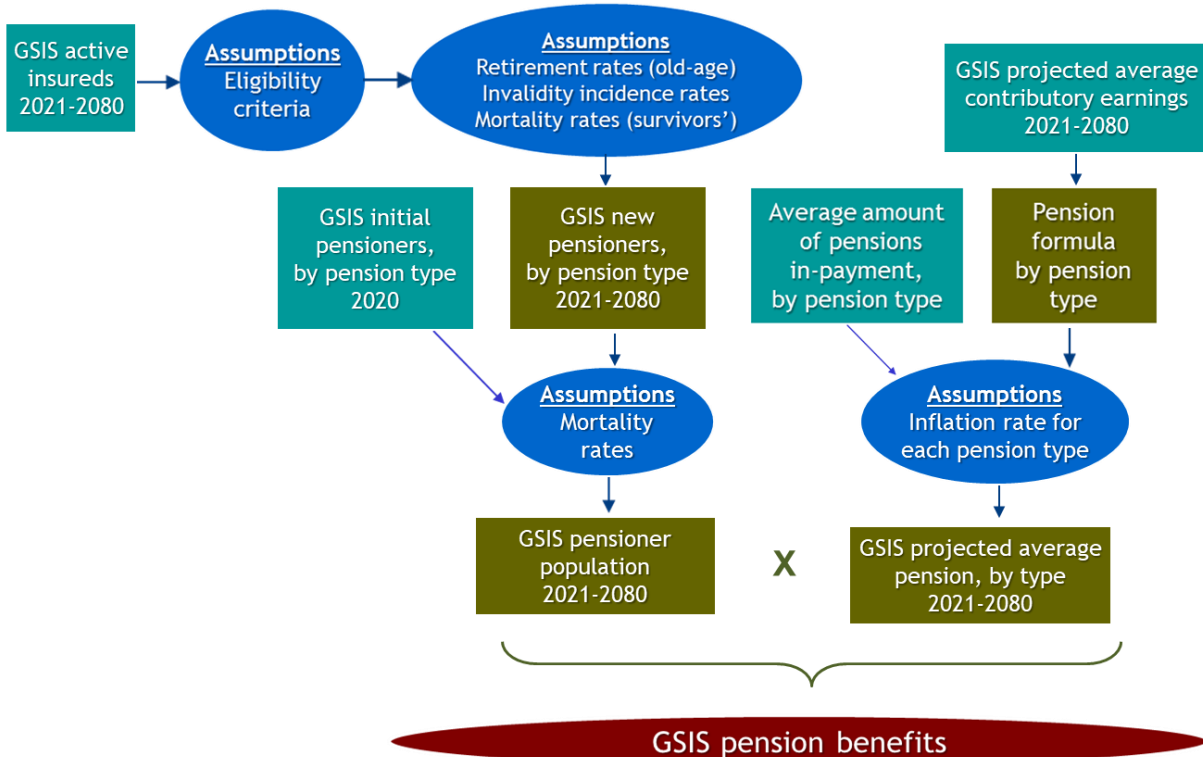
2.2. GSIS financial sustainability

The assumptions and results presented in the following sections make it possible to measure the financial position of the GSIS over the projection period in terms of:

- **Reserve ratio:** The ratio of the level of reserves at the end of one year to the level of expenditures for the same year; the projected reserve ratio may be compared to the minimum target reserve ratio "k", graphically shown in Figure 2.4, and determined by the following formula:

  o k = 4.9 – 0.1 * (t - 2021), for 2021 < t < 2060; and
  o k = 1, for t = 2060 and above.

- **Pay-as-you-go (PAYG) cost rate:** The level of expenditures for one year divided by the total insurable earnings of the same year.

- **General average premium (GAP):** The stable contribution rate needed to be paid over the projection period in respect of the current and future insured population for financing GSIS expenditure over the same period in respect of existing and future beneficiaries.

▶ **Figure 2.4. Minimum target reserve ratio**
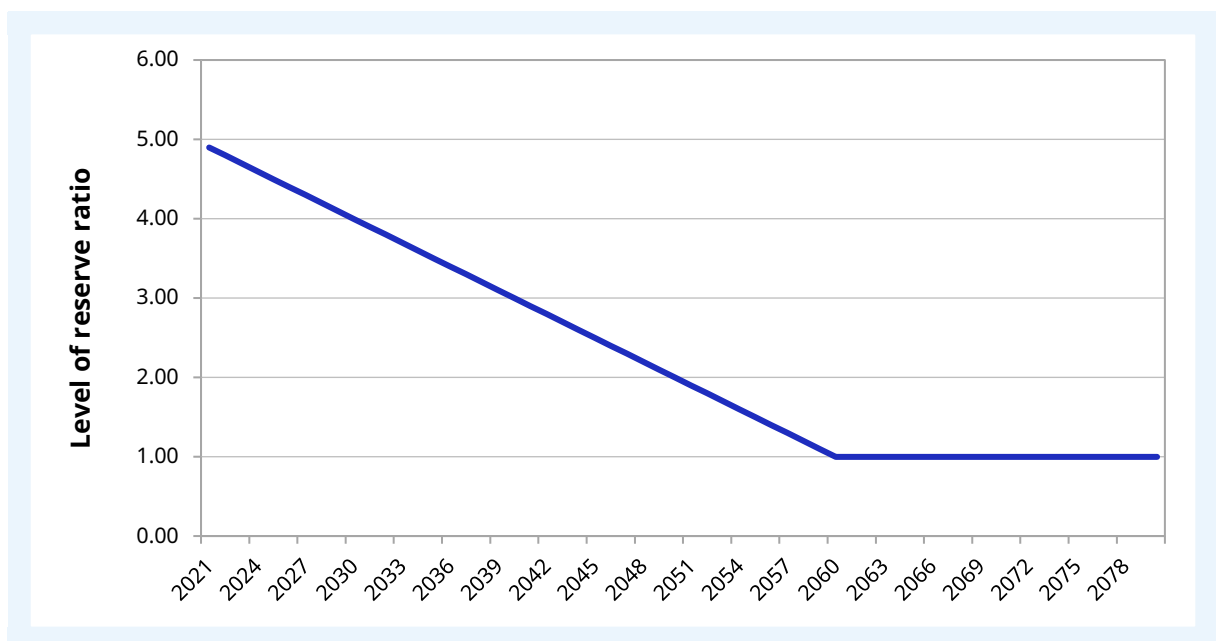
It follows from figure 2.4 that the minimum target reserve ratio is set at the level of 4.9 times annual expenditure in 2021 and linearly decreases to one-time annual expenditure in 2060, remaining stable thereafter at that level. A reserve ratio of one-time the annual expenditure is generally sufficient in mature social security programmes. A reserve of that level provides a sufficient "buffer" to safeguard the programme against fund exhaustion even in the event of sudden adverse economic developments, which might lead to a dramatic reduction in contribution income and an increase in the number of pensioners. It is considered that the basic part of the GSIS is sufficiently mature to operate on the basis of a reserve ratio of one. On the other hand, the supplementary part of the GSIS, which was introduced later than the basic part, will not completely mature until around the end of the 2040s. After that period, the supplementary part of the GSIS could be able to operate on the same level of funding as the basic part, but until then there would be a transition phase of several decades during which the target minimum reserve ratio of the supplementary part will be progressively reduced to the level of one.

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To adequately evaluate the GSIS future financial situation, a projection period of 60 years, 2021 to 2080, is selected. This projection period will allow the inclusion of the effect of the maturity of the supplementary part of the GSIS on its financial status. This period is also consistent with the projection periods of the actuarial valuations of the GSIS produced over the last 20 years, which extended over a minimum period of 50 years. This projection period is sufficient for the purposes of the actuarial analysis. The uncertainty of actuarial projections increases over time because projections then increasingly depend on the assumptions made.

2.3. Pension model

This actuarial valuation makes use of an actuarial pension model which is a fully customized version of the ILO generic pension modelling tool. The model has been customized to closely comply with local social insurance legislation and capture national pension peculiarities. In addition, methodological enhancements to the projection model are introduced on a regular basis in the context of continued improvement of the accuracy of the projection results.

The actuarial model is used primarily for:

- o conducting the actuarial valuation of the GSIS every three years in accordance with the Social Insurance Law;
- o assessing the long-term financial impact of various pension reform alternatives;
- o undertaking actuarial projections of the GSIS every three years in accordance with the EU Ageing Working Group requirements to assess the long-term financial impact of population ageing on GSIS pensions; and
- o conducting the actuarial pension calculations of the GSIS every three years in accordance with the requirements of the European System of National and Regional Accounts (ESA 2010) of Eurostat.

The pension model is a standard deterministic cohort-based projection model performing long-term projections of income and expenditure for the GSIS. In its current version, the model satisfies the following key methodological features:

- The model is based on standard actuarial mathematics for social security schemes and on actuarially assumed transition probabilities (mortality rates, incapacity rates, retirement rates, etc.) which are used to map the transition of an insured person (active person,[1] inactive person[2] and pensioner) in a given year onto the next year's status.

- The development of the active insured population is linked to the evolution of total employed population and earnings assumptions, which, in turn, are explicitly linked to the assumptions on macroeconomic growth and the wage share of GDP.

- The active insured population is disaggregated into the following population groupings:

  - o age (by single age);
  - o gender (males/females);
  - o insurance level (basic only/basic and supplementary);

---

[1] Active insured person refers to an individual who has made at least one contribution to the social security scheme during a given year.

[2] Inactive insured person refers to an individual who has made no contribution during the last year due to being unemployed, or out of the labour force, or emigrant, but is registered in the social security scheme, i.e., made contributions during previous years.

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- community (Cypriots/EU nationals/third-country nationals); and
- income group (by earnings' bands).

- To project the insured population by community, the entry/leaving rates applied in the active insured population, as per the pension model, are linked to the immigration/emigration rates used in the demographic population projections.

- Inactive insured persons are explicitly modelled.

▶ 3. The demographic and economic assumptions

The actuarial valuation of the GSIS must be positioned in the specific demographic and economic context of Cyprus. This requires making assumptions on the demographic and economic environment as well as a certain number of scheme-specific assumptions. This section presents the main demographic and economic assumptions made for the purpose of conducting the present actuarial valuation. Annex 4 presents the scheme-specific assumptions used in this valuation.

It should be noted that the demographic and economic framework used as a basis for the present valuation is limited to the government-controlled area of Cyprus, as the GSIS covers almost exclusively persons in that area.

Since the main aim of this valuation is to review the GSIS financial position until 2080, the assumptions should have a long-term perspective. The assumptions take into account historical trends, the present economic environment and GSIS situation, as well as likely future trends. More emphasis is put on historical long-term trends than on more recent short-term trends.

In setting the assumptions, the opinion and forecasts of international organizations, such as the European Commission with regard to economic assumptions and Eurostat with regard to demographic assumptions, as well as comparisons with the assumptions made by other similar social security schemes at international level, are also taken into account.

These assumptions reflect the Actuary's best estimates of demographic and economic changes. They were chosen to be, independently and in aggregate, reasonable and appropriate, taking into account certain interrelationships between them.

Although assumptions are determined in a reasonable manner, there will inevitably be differences between the future reality and the assumptions made. These differences may have a positive or negative impact on the financial position of the GSIS, compared with the results of this actuarial valuation. Nevertheless, they are analysed and taken into account in subsequent actuarial valuations.

3.1. Demographic framework

A projection of the general population of the country is the basis for determining the number of contributors and beneficiaries. The projection begins with the latest available statistical data on population estimated by the Statistical Service of Cyprus as at 31 December 2020, to which the assumptions on the future development of fertility, mortality and migration are applied.

The current population structure strongly influences the results of projections for the coming years. The age distribution of the starting population shows a gradual ageing of the population in Cyprus, as is the case in many other developed countries.

3.1.1. Fertility

The first cause of this ageing is the large drop in the birth rates in the 1990s and the continuing low level thereafter. In particular, the total fertility rate in Cyprus has decreased sharply from an average level of 2.5 children per woman in the early 1990s to a level below 1.4 since 2011. The total fertility rate has been around to 1.35 since 2016. Figure 3.1 shows the historical total fertility rates for the period from 1990 to 2020.

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▶ **Figure 3.1. Historical total fertility rates, 1990-2020**

Source: Cyprus Statistical Services, Demographic Reports.
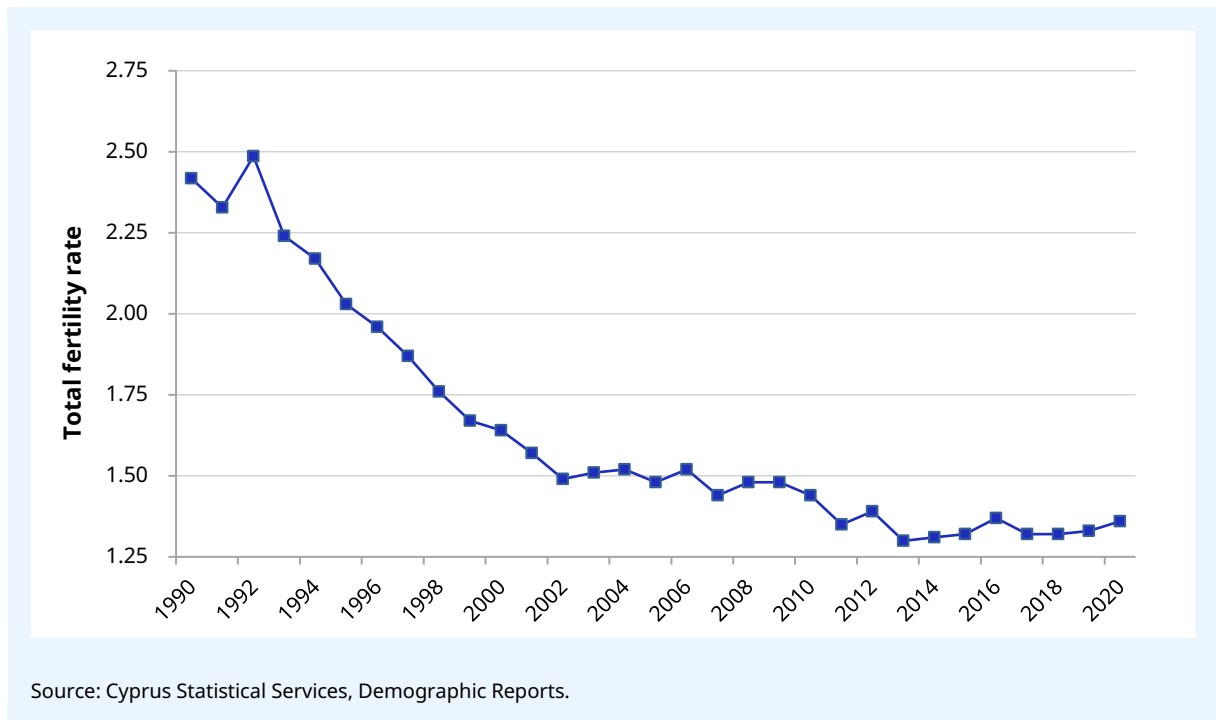
The overall significant decrease in the total fertility rate in the 1990s occurred primarily as a result of changes in a number of social and economic factors. It is unlikely that fertility rates will return to historical levels in the absence of significant societal changes.

In the present valuation, the total fertility rate is estimated at 1.37 children per woman in 2021, increasing gradually to 1.50 in 2061 and increasing only slightly thereafter, reaching 1.55 in 2080.

3.1.2. Mortality

The other significant cause of the ageing of the population in Cyprus is the important reduction of age-specific mortality rates. This can be best measured by the increase in life expectancy.

As figure 3.2 indicates, male life expectancy at birth increased by 11.4 per cent between 1978 and 2020, rising from 72.1 to 80.3 years. For females, life expectancy at birth increased from 76.0 to 84.2 years during the same period, representing an increase of 10.8 per cent. The increase in life expectancy has been particularly important over the decade 2005–2014 for both males and females. Since 2015, the life expectancy has been relatively stable.

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▶ **Figure 3.2. Historical life expectancies at birth, 1978–2020**

Source: Cyprus Statistical Services, Demographic Reports and own calculations.
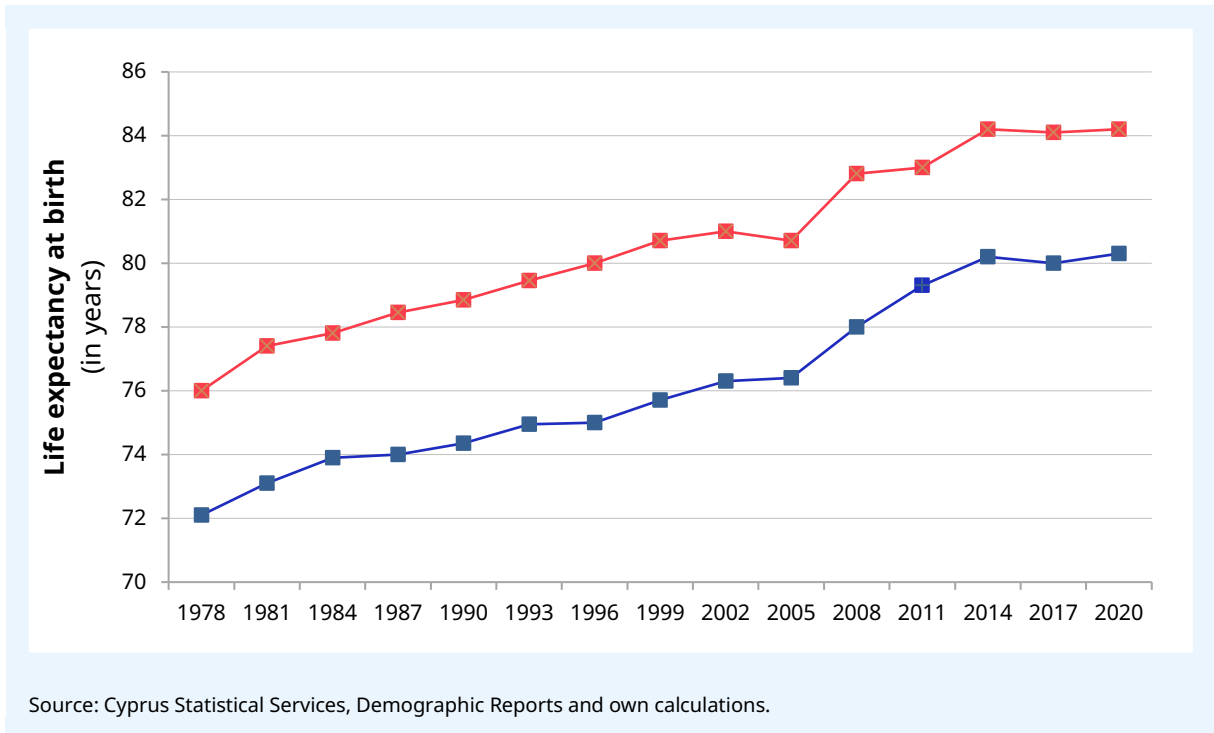
For the present valuation, mortality rates are in line with Eurostat's mortality rates. For the determination of future mortality rates, it is assumed that mortality improvements continue in the future, but at a slower pace than most recently. It is assumed that life expectancies at birth observed in 2020, which were 80.3 for males and 84.2 for females, will gradually increase to 87.7 for males and 91.2 for females in 2080. The overall expected rates of mortality improvement over the projection period for both males and females correspond to 54 per cent of the mortality improvement observed over the period 1990-2020. Finally, the gap between the life expectancy of men and women is expected to slightly decrease from 3.9 years in 2020 to 3.5 years in 2080. Sample mortality rates can be found in Annex 4.

3.1.3. Net migration

Net migration in Cyprus (i.e., the excess of immigration over emigration) has been positive and relatively stable over the period 1995-2005, fluctuating between 4,000 and 9,000 net migrants per year. During the period 2006-2011, the number of net migrants was exceptionally high, reaching 18,142 in 2011. In years 2012-2014, the number of net migrants dropped significantly and became negative, primarily due to labour oversupply in certain sectors of the economy resulting from the economic crisis. In years 2015–2019, net migration experienced a strong increase, reaching 8,797 in 2019. This increase was reversed in 2020, where net migration dropped to 4,493 as a result of the COVID-19 pandemic.

Based on the observed values for 2021, it is projected that net migration will experience a strong increase over the period 2021-2025 and will remain at high levels up to 2030, with an average of around 9,000 over the period 2021-2030. From 2030 to 2050, the annual net migration is projected to gradually decrease to 7,800 in 2050. Over the remaining period from 2050 to 2080, the annual net migration is projected to gradually decrease to 5,800 by 2080.

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▶ **Figure 3.3. Historical net migration flows, 1995–2020**

Source: Cyprus Statistical Services, Demographic Reports and author's calculations.
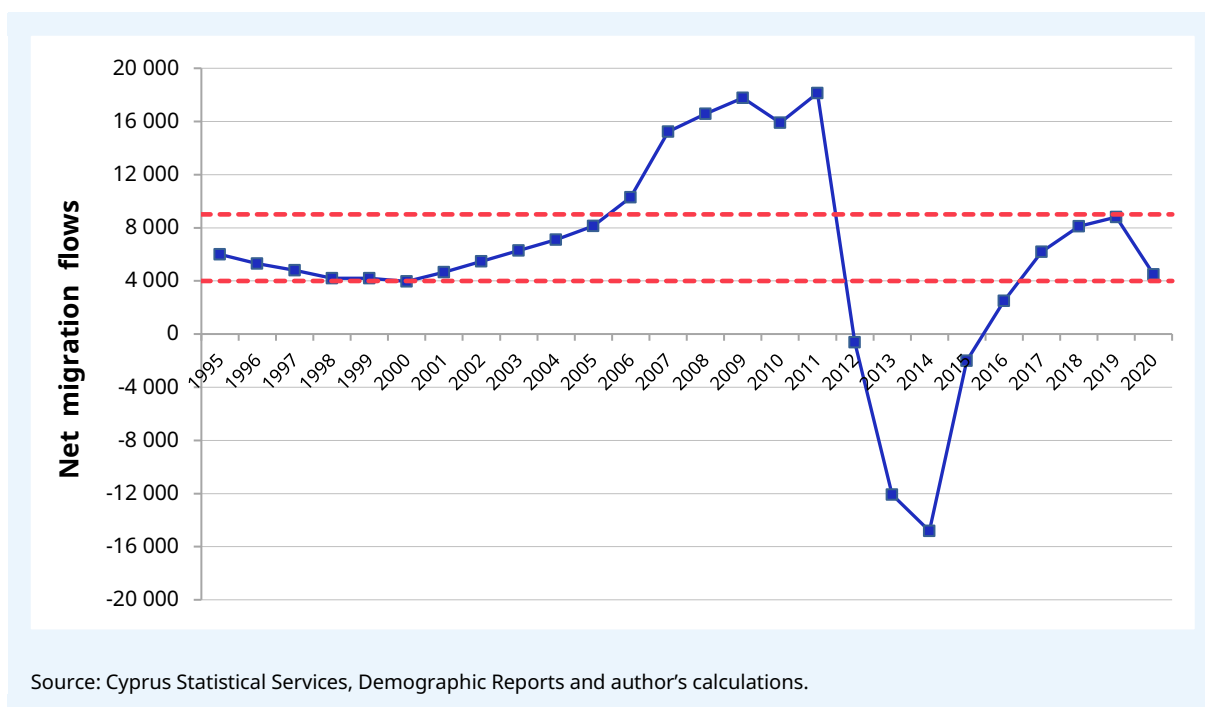
3.1.4. Population projections

According to the above assumptions, the population of Cyprus is projected to increase from its present observed level of 915,359 persons in 2020 to 1,480,164 in 2080.

Table 3.1 shows the development of population for three age groups (0-14, 15-64 and 65+) throughout the projection period of 2021 to 2080, as well as the old-age dependency ratio, i.e., the ratio of the number of people aged 65 and over to those aged 15-64. This ratio, which provides a demographic measure of population ageing, is projected to increase continuously from 25 per cent in 2021 to 39 per cent in 2060. Over the rest of the projection period, the above ratio is expected to slightly increase to 45 per cent. In other words, in 2080, it is expected that Cyprus will have 2.2 working-age people for every person aged 65 and over.

An increase in the old-age dependency ratio directly affects the demographic ratio of the GSIS number of contributors to the number of pensioners, as is seen in Section 4.4.1.

▶ **Table 3.1. Projection of the population of Cyprus, 2021–2080**

Year	Number of persons by age group				Old-age dependency ratio (%)
	0-14	**15-64**	**65 and over**	**Total**	
2021	146 759	623 602	155 553	925 914	25
2022	149 624	628 899	159 378	937 901	25
2023	151 865	634 619	163 601	950 085	26
2025	155 388	646 425	172 856	974 669	27
2030	164 152	674 368	196 029	1 034 548	29
2035	171 575	702 849	215 691	1 090 116	31
2040	174 561	734 633	232 745	1 141 939	32
2045	179 264	764 075	248 655	1 191 994	33

Year	Number of persons by age group				Old-age dependency ratio (%)
	0-14	**15-64**	**65 and over**	**Total**	
2050	185 920	785 683	268 319	1 239 923	34
2055	193 346	802 024	291 178	1 286 548	36
2060	199 964	813 522	317 712	1 331 198	39
2065	205 273	828 189	340 503	1 373 964	41
2070	209 269	846 093	358 300	1 413 662	42
2075	212 708	860 455	375 918	1 449 081	44
2080	216 564	872 106	391 494	1 480 164	45

3.2. Economic and labour market framework

The general economic developments and the evolution of the labour market directly influence the financial development of the GSIS. The evolution of the gross domestic product, its primary factor income distribution, labour productivity, employment and unemployment, wages, inflation and interest rates have direct and indirect impacts on the projected revenue and expenditure of the GSIS.

3.2.1. Economic growth

During the 1980s, the Cyprus economy grew at an average annual (real) rate of 6.3 per cent, while during the 1990s it grew at a much lower rate of 4.1 per cent. Over the period 2001-2008, real GDP grew at an average rate of 4.2 per cent, whereas over the period 2009-2014, the economy contracted at an average rate of 1.9 per cent. Over the 5-year period 2015-2019, real GDP grew significantly at an average rate of 5.4 per cent while for 2020 economy contracted with a rate of 4.4 per cent as a result of COVID-19 pandemic. Finally, in 2021, economy expanded at a rate of 6.6 per cent.

The real GDP growth is expected to gradually decrease from 6.6 per cent in 2021 to 2.3 per cent in 2025, averaging to 3.9 per cent over the 5-year period 2021–2025. Thereafter, it is expected to slightly decrease from 2.1 per cent in 2026 to 1.9 per cent in 2029, averaging to 2.0 per cent over the period 2026-2029. Over the rest of the projection period, we expect GDP real growth rates to remain stable at a level of 1.9 per cent.

As shown in table 3.2, during the whole projection period the driving forces behind economic growth will be primarily an increase of labour productivity and to a lesser extent additional employment.

▶ **Table 3.2. Annual growth of GDP, productivity and employment, 2021–2080** (percentages)

Period	Annual real GDP growth	Annual increase of productivity per worker	Annual employment growth (15-74)
2021–2030	2.9	1.5	1.5
2031–2040	1.9	1.0	0.9
2041–2050	1.9	1.1	0.8
2051–2060	1.9	1.3	0.6
2061–2070	1.9	1.4	0.5
2071–2080	1.9	1.5	0.3

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3.2.2. Labour force, employment and unemployment

In the long run, labour supply is basically determined by the development of the population and its structure, and by changes in labour market behaviour of private households.

Over the period 2017–2020, the overall labour force participation rate[3] for females for the age group 15 to 64 increased marginally, while the corresponding participation rate for the age group 55 to 64 experienced a strong increase over the same period. In particular, the female participation rate for the age group 15 to 64 increased by 0.4 percentage points, from 69.3 per cent in 2017 to 69.7 per cent in 2020, whereas the rate for the age group 55 to 64 increased by 3.4 percentage points, from 48.9 in 2017 to 52.3 in 2020. It is noted that in 2021 the participation rate for the age group 15 to 64 increased by 1.3 percentage points, and it is expected to continue increasing and in the future.

For the male population, over the period 2017-2020 the overall participation rate for the age group 15 to 64 experienced a strong increase of 3.5 percentage points, from 78.8 in 2017 to 82.3 in 2020. As well, the corresponding participation rate for the age group 55 to 64, over the same period, experienced a strong increase by 6.2 percent, from 71.6 in 2017 to 77.8 in 2020.

As shown in table 3.3 and figure 3.4, over the projection period the average labour force participation rate for males aged between 15 and 64 is assumed to moderately increase from its current level of 82.7 per cent in 2021 to 84.2 per cent in 2080. Changes in the male average participation rate result mainly from the anticipated increase in the average exit age from the labour force due to the recent GSIS reform measures, as well as changes in the structure of the active population over time (changing weight of different age groups in the total population), and thus reflect the general ageing process of the male Cypriot population.

For females, the average participation rate is assumed to grow quite significantly from its current level of 71.0 per cent in 2021 to 76.4 per cent in 2080. The increase is considerable for the period up to the year 2060, when the rate reaches a level of 75.9 per cent. Increases in the female participation rate over the projection period are primarily driven by the needs of a continuously growing economy as well as the anticipated increase in the average exit age from the labour force due to the recent GSIS reform measures.

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[3] The labour force participation rate is defined as the labour force aged 15 to 64 divided by the population aged 15 to 64.

▶ **Figure 3.4. Projected labour force participation rates, 2021–2080**

Source: Cyprus Statistical Services, Demographic Reports and author's calculations.
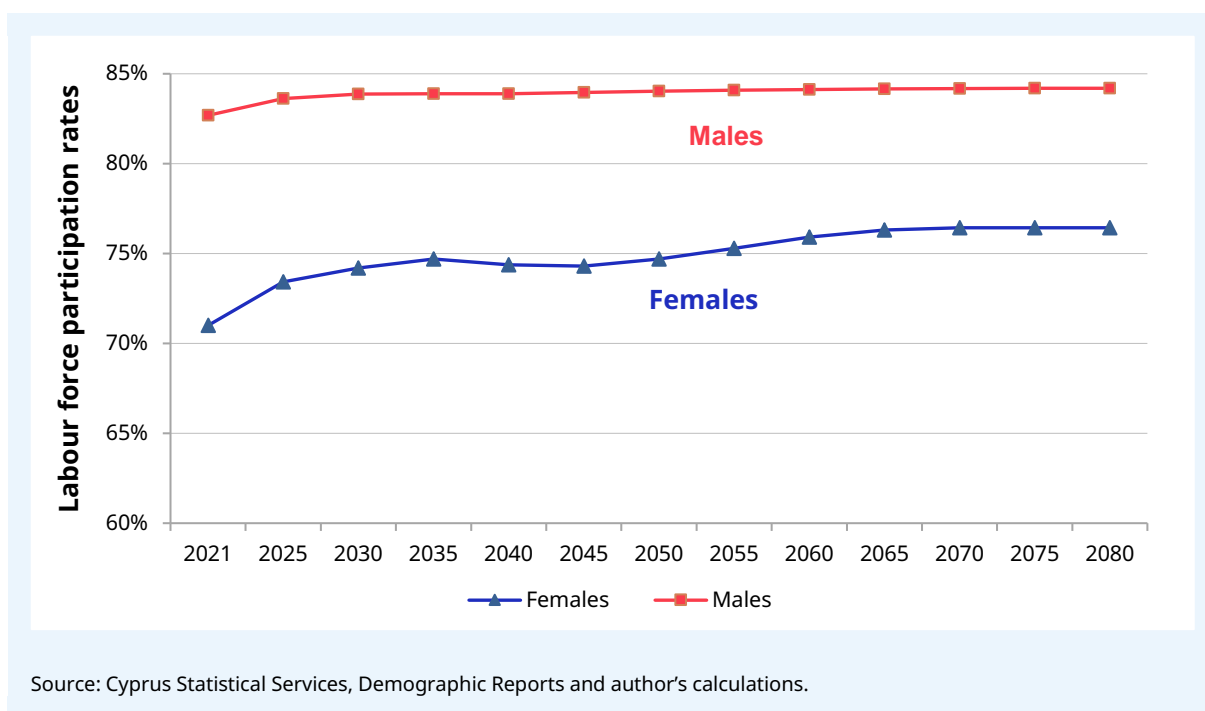
▶ **Table 3.3. Assumptions of labour force participation, employment and unemployment rates, 2021–2080** (percentages)

	2021	2030	2040	2050	2060	2070	2080
Labour force participation rate (15-64)							
Male	82.7	83.9	83.9	84.0	84.1	84.2	84.2
Female	71.0	74.2	74.4	74.7	75.9	76.4	76.4
Total	76.7	78.9	79.1	79.4	80.1	80.3	80.4
Employment rate (15-64)	70.9	73.8	74.1	74.5	75.2	75.6	75.8
Unemployment rate (15-64)	7.6	6.5	6.3	6.2	6.1	5.9	5.7

Once the labour force participation rates are determined on the basis of age group and gender, they are applied to the projected population to obtain the labour force. This results in a considerable growth of the labour force up to 2080.

The projected number of employed persons is then derived by applying the unemployment rates to the projected labour force. As shown in table 3.3, the unemployment rate for both males and females is anticipated to gradually fall from its current level of 7.6 per cent in 2021 to 5.7 per cent in 2080.

Table 3.3 also shows the development of the overall employment rate (the ratio of the number of employed persons aged 15-64 to the number of people aged 15-64), which is expected to increase from 70.9 per cent in 2021 to 75.8 per cent in 2080.

Figure 3.5 shows the changes in the population aged 15 to 64 over the projection period 2021-2080 according to the labour force status: employed, unemployed and inactive persons.

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▶ **Figure 3.5. Evolution of the distribution of population aged 15-64, by labour force status, 2021–2080**
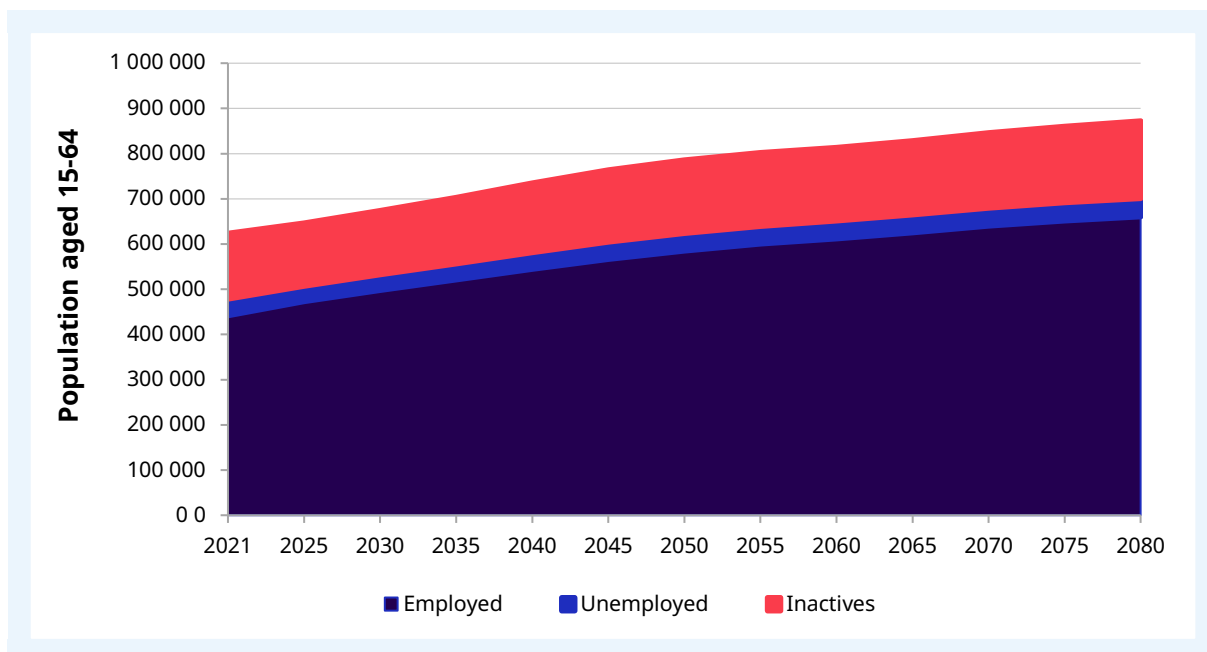
3.2.3. Inflation, wages, and interest rates

Price inflation, as measured by the consumer price index, tends to fluctuate from year to year. The desire of the European Central Bank to maintain inflation rates below but close to 2 per cent, leads us to expect an ultimate constant inflation rate of 2 per cent throughout the projection period. The average inflation rate for the euro area since 1999, when the euro currency was formally introduced, has been 1.8 per cent.

In Cyprus, consumer prices fell by 1.1 per cent in 2020 while in 2021 rose by 2.3 per cent. As shown in table 3.4, the annual price inflation is assumed to be 8.1 per cent in 2022 and 3.8 per cent in 2023 and thereafter to continue decreasing annually until it reaches its long-term rate of 2 per cent in 2027.

The real rate of increase in average wages in the long term is tied to increases in labour productivity. This assumption also considers the anticipated growth of the labour force in future. Given the current economic environment, a real wage growth of 0.1 per cent, on average, is assumed over the period 2021-2023. Over the following five years, the period 2024-2028, the real wage growth is set to average 1.1 per cent. Thereafter, over the remaining projection period, it is also assumed to average 1.3 per cent, fluctuating between 0.9 and 1.6 per cent.

Table 3.4 shows the expected evolution of *nominal* wage growth rates. In the short term, over the 3-year period 2021-2023, nominal wage growth is assumed to average 3.7 per cent. For the rest of the projection period, it is expected to be in the range of 2.9 to 3.6 per cent, averaging 3.3 per cent.

The interest rate is required for the projection of revenue arising from investment income. This assumption is based on the projection of the rate of return on GSIS assets, which are currently invested for their most part in non-tradeable government deposits (98.6 per cent) while the remaining assets are invested in medium-term government bonds and cash deposits held with commercial and cooperative banks in Cyprus.

The interest rate of the Social Insurance Fund on non-tradeable government deposits is calculated as the marginal lending facility rate of the European Central Bank less 0.25 per cent. The assumed initial

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rate of return reflects observed rates of returns on GSIS assets for 2021, whereas the assumed ultimate real rate of return on GSIS assets is derived from the historical real rates of return on the European Central Bank's marginal lending facility rate over the 20-year period since the introduction of the euro currency on 1 January 1999.

As shown in table 3.4, the annual nominal rate of return on GSIS assets is projected to gradually decrease from its current level of 2.96 per cent in 2022 to 2.25 per cent in 2031 and to remain constant thereafter.

▶ **Table 3.4. Assumptions of inflation rate, nominal increase of average wages and nominal interest rate (rate of investment return), selected years, 2021–2080** (percentages)

Year	Inflation rate	Nominal increase of wages	Nominal rate of investment return
2021	2.3	1.2	0.37
2022	8.1	5.2	2.96
2023	3.8	4.8	2.88
2030	2.0	2.9	2.33
2040	2.0	3.0	2.25
2050	2.0	3.2	2.25
2060	2.0	3.4	2.25
2070	2.0	3.5	2.25
2080	2.0	3.6	2.25

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▶ 4. Results

This valuation deals with the ability of the GSIS to meet its future obligations at the time they fall due. This is done under an open-group approach. It is assumed that working persons will continue to be insured under the GSIS, thus paying contributions and accruing benefit entitlements, until later when they receive benefits in accordance with the legal provisions of the GSIS. Future contributions and benefits are calculated:

- o according to the methodology covered in Section 2;
- o according to the demographic and economic assumptions presented in Section 3; and
- o on the basis of the GSIS-specific database presented in Annex 4.

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

This valuation deals with the expenditure and revenue of all branches of the GSIS: unemployment benefits, other short-term and employment injury benefits, and long-term pension benefits. The Social Insurance Fund is currently separated into the following four accounts:

- o the Unemployment Account records operations of the GSIS concerning the unemployment benefit;
- o the Other Benefits Account records operations of the GSIS concerning other short-term benefits, employment injury benefits and administration expenses;
- o the Basic Pensions Account records operations concerning revenue and expenditures with respect to pensions in the basic part of the GSIS; and
- o the Supplementary Pensions Account records operations concerning revenue and expenditures with respect to pensions in the supplementary part of the GSIS.

Table 4.1 shows the benefits covered by and the contribution rate allocated into each account for an employed person as at 31 December, 2020.

The key area of concern will be the long-term branch, since it counts for the largest proportion of future expenditure. In addition, it is certain that this proportion will grow significantly in the future due to the current immature state of the supplementary part of the GSIS. Long-term benefits will attain a mature state only after the youngest persons of the first generation of contributors will have died as pensioners. This requires that the situation of the GSIS is analysed over several decades.

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▶ **Table 4.1. Benefits covered and contribution rate by account for employed persons as at 31.12.2020**

Account	Benefits covered	Contribution allocation (as % of insurable earnings)
Unemployment	Unemployment benefit	1.15
Other Benefits	Sickness benefit, maternity allowance, maternity grant, funeral grant, employment injury benefits and administration expenses	1.15
Basic Pensions	Basic part of the GSIS: old-age pension, invalidity pension, widow's pension, orphan's benefit and other related lump sum benefits	12.00
Supplementary Pensions	Supplementary part of the GSIS: same as those mentioned under Basic Pensions Account	7.20
Total		**21.50**

In addition to the income from contributions, the Basic and Supplementary Pensions Accounts are credited with investment income and charged with long-term benefits of the respective part of the GSIS. The annual net balances of the accounts serve to increase the reserves in the respective part of the GSIS.

Unemployment and other short-term benefits, as well as employment injury benefits, are in principle financed on a pay-as-you-go (PAYG) basis. The level of contingency reserves held under the Unemployment and Other Benefits Accounts may not exceed one time the annual expenditure of the benefits covered by each account.

4.1. Unemployment benefit

As shown in figure 4.1, unemployment benefits as well as underlying unemployment rate in the labour force have experienced important variations over recent years. In particular, over the period 2005–2009, the total expenditure expressed as a percentage of total insurable earnings (TIE) remained at a relatively low level, below the contribution rate of 1.15 per cent currently allocated to the Unemployment Account. Over the period 2010-2013, the total expenditure expressed as a percentage of insurable earnings increased significantly from 1.21 in 2010 to 2.34 in 2013, as a result of the economic downturn. The upward trend in expenditure was reversed in 2014, when the total expenditure as a percentage of insurable earnings started decreasing, reaching to 1.02 in 2019, which is below the income from contributions (1.15 per cent). During the year 2020, government put in place specific programs under which additional benefits were granted to unemployed persons. These programs were exceptionally released to alleviate the adverse economic impact of COVID-19 pandemic. The cost of these programs significantly increased the ratio of total expenditure over insurable earnings to 1.43 per cent. For 2021, the annual expenditure significantly dropped, and led to a ratio of total expenditure over insurable earnings of 0.63 per cent.

▶ **Figure 4.1. Past expenditure on unemployment benefit as a percentage of insurable earnings, 2005–2021**
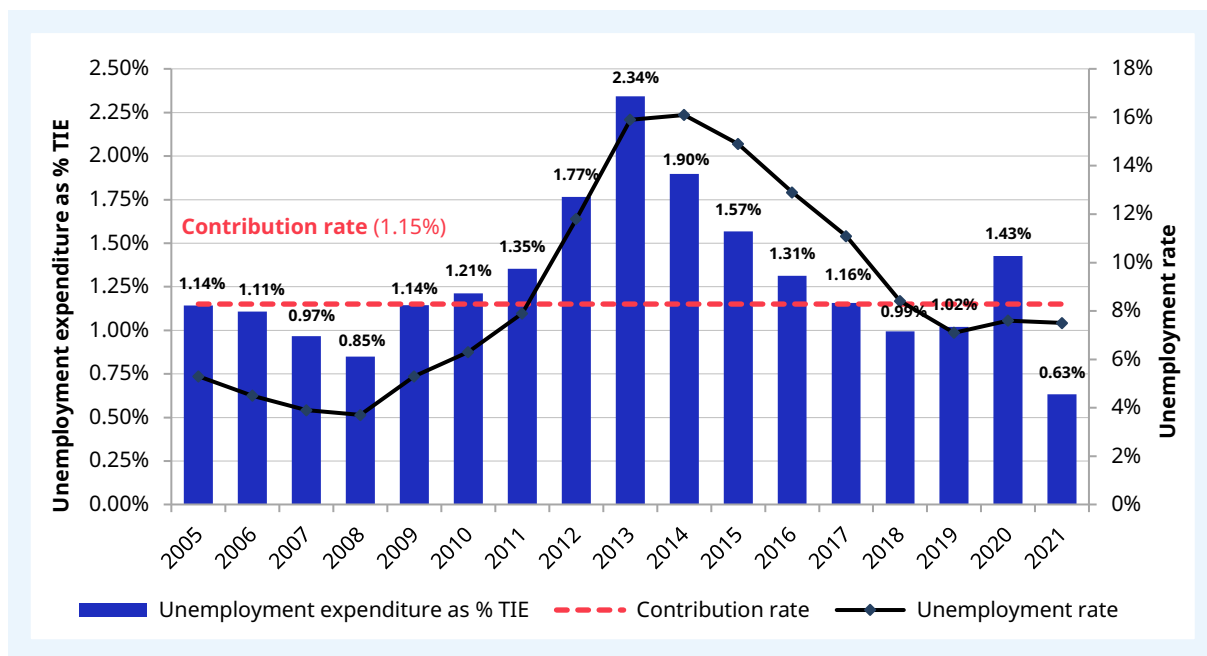
As it is illustrated by table 4.2, over the 6-year period 2016-2021, the average annual expenditure on unemployment benefits amounted to approximately €82 million. Over the same period, the total expenditure expressed as a percentage of total insurable earnings averaged to an annual rate of 1.09 per cent, which is slightly below the income from contributions allocated to the Unemployment Account (1.15 per cent).

▶ **Table 4.2. Expenditure on unemployment benefit, 2016–2021**

Year	Annual expenditure on benefits (in €)	Expenditure as % of insurable earnings of employed persons
2021	54 224 580	0.63
2020	109 993 122	1.43
2019	83 575 236	1.02
2018	76 242 272	0.99
2017	81 444 714	1.16
2016	85 901 795	1.31
Average	**81 896 953**	**1.09**

In line with the expected evolution of the unemployment rate, a relatively stable to low levels unemployment expenditure is expected to continue in the short and medium term. As shown in figure 4.2, the expenditure on unemployment benefit, expressed as a percentage of insurable earnings, is projected to increase from 0.63 per cent in 2021 to 1.01 per cent in 2030. Over the same period, the annual expenditure is projected to be, on average, 0.92 per cent, i.e., 0.23 percentage points below the contribution rate (1.15 per cent).

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▶ **Figure 4.2. Projected expenditure on unemployment benefit as a percentage of insurable earnings, 2021–2030**
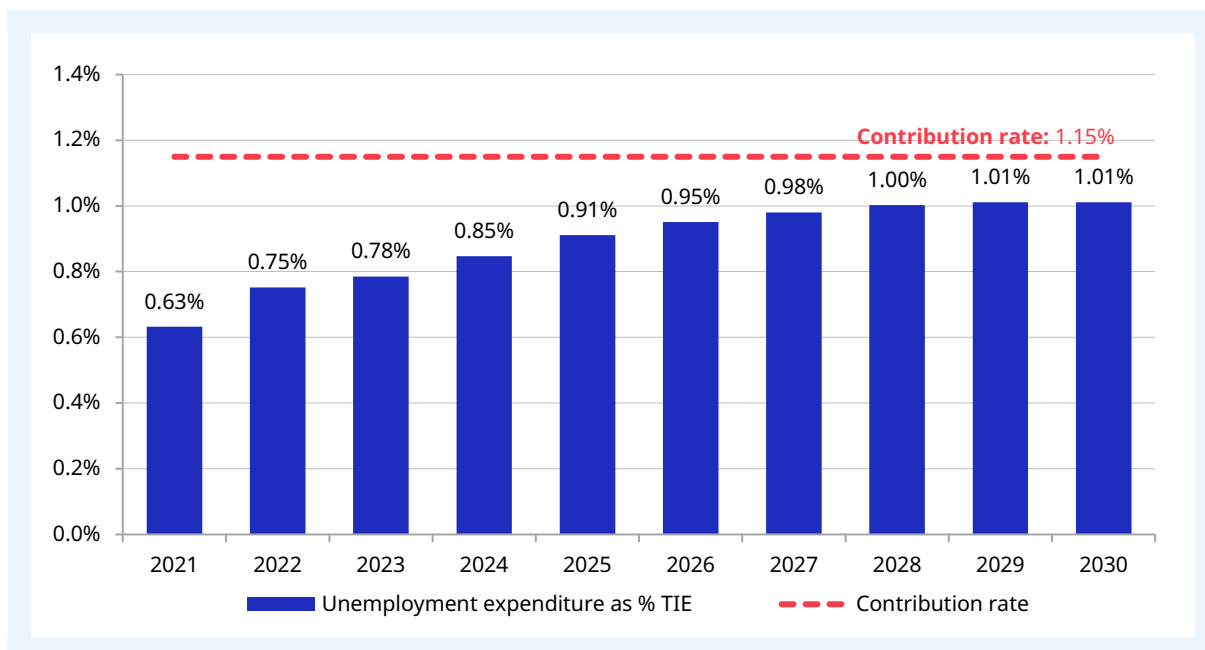
Given the recent experience of expenditure on unemployment benefits, the risk of future fluctuations in this expenditure and the level of uncertainty in the decreasing pattern of the unemployment rate in the short and medium term, it is recommended to leave the current contribution rate of 1.15 per cent of the insurable earnings of employed persons unchanged, but it is vital that the financial position of the Unemployment Account is monitored on an annual basis, so that, where necessary, corrective measures are taken.

4.2. Other short-term and employment injury benefits

The benefit branch named "Other Benefits" includes sickness benefit, maternity allowance, paternity allowance,[4] grant benefits (maternity grant, marriage grant and funeral grant) and employment injury benefits (injury benefit, disablement benefit and death benefit). As shown in figure 4.4, over the 14-year period 2008-2021, the expenditure under this benefit branch represented 1.08 per cent of insurable earnings (on average), slightly below the contribution rate of 1.15 per cent currently allocated to the Other Benefits Account in respect of employed persons. The experience has been relatively stable over the above period.

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[4] Paternity allowance was introduced as from 1 August 2017.

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▶ **Figure 4.3. Short-term benefits as a percentage of insurable earnings, 2008–2021**
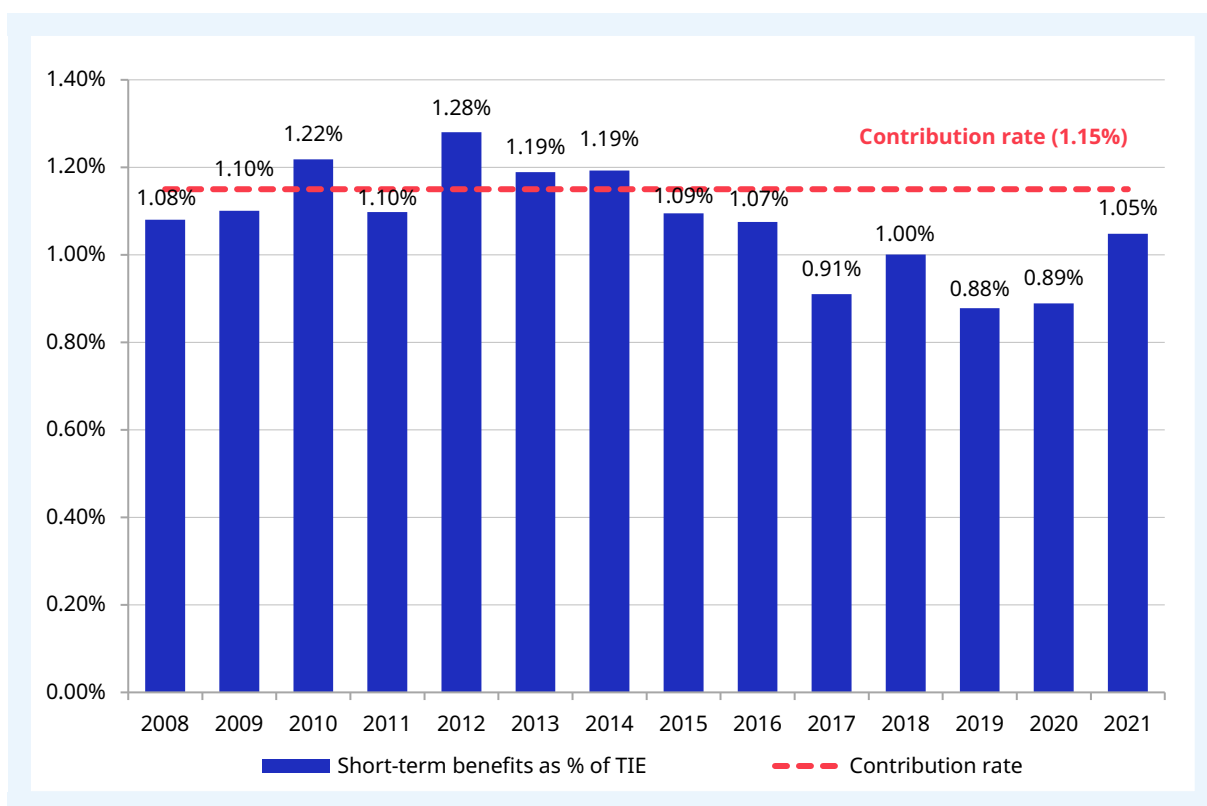
Table 4.3 presents the detailed experience of this benefit branch for the years 2018, 2019, 2020 and 2021. Over that period, sickness benefits have represented on average 0.44 per cent of insurable earnings, maternity/paternity allowance 0.34 per cent, grant benefits 0.07 per cent and employment injury benefits 0.10 per cent. The total expenditure of other short-term and employment injury benefits has averaged 0.95 per cent of insurable earnings over the four-year period 2018–2021.

▶ **Table 4.3. Expenditure on short-term and employment injury benefits, 2018–2021**

Year 2018	Annual expenditure (in €)	Expenditure as % of total insurable earnings
Sickness benefit	35 317 184	0.44
Maternity/Paternity allowance	31 459 534	0.39
Grant benefits	5 971 702	0.07
Employment injury benefits	8 341 765	0.10
Total	**81 090 185**	**1.00**

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Year 2019	Annual expenditure (in €)	Expenditure as % of total insurable earnings
Sickness benefit	35 533 773	0.41
Maternity/Paternity allowance	25 438 919	0.29
Grant benefits	6 057 447	0.07
Employment injury benefits	8 761 398	0.10
Total	**75 791 537**	**0.88**

Year 2020	Annual expenditure (in €)	Expenditure as % of total insurable earnings
Sickness benefit	30 044 631	0.37
Maternity/Paternity allowance	28 795 856	0.36
Grant benefits	4 829 264	0.06
Employment injury benefits	8 060 306	0.10
Total	**71 730 056**	**0.89**

Year 2021	Annual expenditure (in €)	Expenditure as % of total insurable earnings
Sickness benefit	48 480 540	0.54
Maternity/Paternity allowance	29 853 342	0.33
Grant benefits	8 060 363	0.09
Employment injury benefits	7 755 895	0.09
Total	**94 150 140**	**1.05**

Given the experience on other short-term and employment injury benefits over the last 14 years and the relative stability of the expenditure as a percentage of insurable earnings observed over the same period, it is recommended to keep unchanged the current contribution rate of 1.15 per cent of insurable earnings in respect of employed persons.

4.3. Administration expenses

The actual cost of administration expenses for the years 2018, 2019 and 2020 was relatively stable at 0.11 per cent of insurable earnings. As mentioned above, the administration expenses are currently covered by the Other Benefits Account. Based on the experience of the total expenditure on benefits offered under that Account over the three-year period 2018-2020, the viability of the Other Benefits Account is secured.

4.4. Long-term benefits

4.4.1. Demographic projections

Table 4.4 shows the anticipated development of the number of contributors, the number of pensions by type of pension benefit and by sex, as well as the ratio of the number of contributors to the total number of pensions (old-age, invalidity, widows, widowers and orphans). This ratio measures the number of contributors who could support the number of pensions paid out at any point in time.

The number of contributors is directly linked to the assumed labour force participation rates applied to the working-age population. Hence, the demographic and labour market assumptions have a great impact on the expected number of future contributors. As shown in table 4.4, the number of GSIS contributors is expected to increase continuously for the rest of the projection period due to the projected increase in the working-age population and labour force. Over the projection period, the number of contributors is expected to increase by 57 per cent, i.e., from 515,510 in 2021 to 810,699 in 2080.

The number of old-age, invalidity and widow's pensions increases for several decades. In particular, the number of old-age pensioners is expected to more than double over the next 30 years due to population ageing, increasing from 131,604 in 2021 to 265,506 in 2050.

Furthermore, the number of *male* old-age pensioners is projected to grow by a factor of 2.3, i.e., from 76,254 in 2021 to 178,954 in 2080, while the number of female old-age pensioners in 2080 will represent 3.2 times the number estimated in 2021, i.e., from 55,350 in 2021 to 175,961 in 2080. The important increase in the number of female pensioners is mainly due to the increased participation of women in the labour force projected under the macroeconomic frame of the valuation.

Female old-age pensioners are expected to outnumber their male counterparts by year 2050. In 2080, it is projected to be 2,993 (or 1.7 per cent) more female than male old-age pensioners. Over the same period, the number of invalidity and widow's/widower's pensioners is projected to continuously increase, but at a much slower pace than for old-age pensioners.

The ratio of contributors to pensions is projected to decrease from 3.0 in 2021 to 1.8 in 2080, whereas the ratio of contributors to old-age and invalidity pensioners is projected to decrease from 3.8 in 2021 to 2.2 in 2080.

4.4.2. Financial ratios

The future evolution of the average pension under the GSIS may be analysed through the evolution of the aggregate replacement ratio, which is defined as the ratio of the average first pension for new old-age pensioners, who did not emigrate from Cyprus prior to their retirement, to the average earnings of the active contributors aged 55 and over.

In the basic part of the GSIS, as shown in table 4.5, the aggregate replacement ratio is presently 31 per cent for males and 37 per cent for females. Given that the minimum pension is equal to 85 per cent of the full basic pension in the basic part of the GSIS, the range between the minimum and the maximum (full basic) pension is quite narrow. The projected aggregate replacement ratios shown in table 4.5 will remain relatively stable at around these levels in the future given the state of maturity of the GSIS and the presence of the minimum pension.

The supplementary part of the GSIS has not reached the state of maturity. This part of the GSIS was introduced in 1980. It will thus take about another decade before workers will have a history of contribution to the supplementary part of the GSIS covering their whole career. Unlike the situation in the basic part of the GSIS, the aggregate replacement ratios in the supplementary part are increasing with time. In the supplementary part of the GSIS, the pension is directly proportional to the period of contribution. As shown in table 4.5, a relative stability of the aggregate replacement ratios will be reached around 2030, after 50 years of existence of this part of the GSIS. In that year, the aggregate replacement ratio of new old-age pensioners will be 41 per cent for males and 35 per cent for females, and it will stay at around these levels thereafter.

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▶ **Table 4.4. Demographic projections for long-term benefits, 2021–2080**

Year	Contri-butors	Number of pensions							Ratio of contributors to pensions
		Old age		Invalidity		Widows Widowers	Orphans	Total	
		Males	Females	Males	Females				
2021	515 510	76 254	55 350	2 922	1 718	34 449	731	171 424	3.0
2022	529 397	79 058	58 283	2 816	1 688	35 564	764	178 174	3.0
2023	544 560	81 666	60 588	2 700	1 674	36 685	783	184 097	3.0
2025	559 910	85 464	64 424	2 552	1 642	38 902	770	193 753	2.9
2030	597 158	92 024	74 302	2 427	1 770	44 443	689	215 655	2.8
2035	632 282	96 778	83 510	2 576	2 025	50 058	593	235 539	2.7
2040	665 584	106 635	99 570	2 940	2 301	55 306	591	267 342	2.5
2045	695 900	114 256	113 510	3 255	2 491	59 789	602	293 902	2.4
2050	721 551	131 486	134 020	3 450	2 610	63 067	592	335 225	2.2
2055	745 609	143 822	148 985	3 604	2 714	66 253	571	365 949	2.0
2060	759 691	157 621	164 060	3 652	2 691	70 358	544	398 925	1.9
2065	775 252	169 743	176 642	3 671	2 596	75 245	516	428 414	1.8
2070	792 914	172 425	178 439	3 764	2 592	79 023	497	436 740	1.8
2075	803 350	175 235	177 633	3 958	2 764	80 282	489	440 361	1.8
2080	810 699	178 954	175 961	4 125	2 924	78 868	478	441 309	1.8

Note: For the purpose of the actuarial projections, the orphans aged 21 and over have been considered as widows' pensions recipients.

▶ **Table 4.5. Aggregate replacement ratios of new old-age pensioners, 2021–2045** (percentages)

Year	Basic insurance[1]		Supplementary insurance	
	Males	Females	Males	Females
2021	31	37	35	28
2022	31	36	36	30
2023	31	36	37	31
2025	32	38	38	32
2030	33	41	41	35
2035	33	40	39	35
2040	34	40	39	35
2045	33	39	38	35

Note: [1] For the purposes of calculating basic insurance replacement rates, the available portion of supplementary pension, which would bring the basic pension up to its maximum level (full basic), is added to the basic pension. This additional supplementary pension is subject to wage rather than price indexation.

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4.4.3. Financial projections

The projection of the revenue and expenditure components of the GSIS pension accounts and the evolution of the reserve of the GSIS are presented in table 4.6. Following are the main observations:

- The reserve ratio at the end of the projection period, i.e., in year 2080, is projected to be at an adequate level of 3.0. It can thus be concluded that the schedule of the legislated contribution rate (second column of table 4.6) is sufficient to ensure the long-term sustainability of the GSIS.

- The future evolution of the legislated contribution rate is closely linked to the projected evolution of the pay-as-you-go (PAYG) cost rate of the GSIS (last column of table 4.6) until the year 2059, when the PAYG rate is projected to reach 24.3 per cent, which is almost the same level as the legislated contribution rate of 24.4 per cent.

- Contributions alone are sufficient to meet the GSIS annual expenditure over the projection period 2021–2061. For the projection period 2062–2080, a part of the investment earnings is used, in addition to contributions, to meet the GSIS expenditures.

- During the whole projection period, the total of contributions and investment earnings each year is sufficient to meet the GSIS annual expenditure.

- Over the period 2021–2045, there is an upward trend in the reserve ratio, primarily due to the increased income from contributions, resulting from favourable demographics (high migration) and positive economic developments.

- Over the period 2045–2060, the reserve ratio is projected to remain relatively stable, averaging at 5.7, primarily due to the impact of the automatic adjustment mechanism of linking retirement age with the evolution of life expectancy.

- From 2060 onwards, the reserve ratio starts to gradually decrease from 5.1 in 2060 to 3.0 in 2080, primarily due to prolonged demographic pressures, resulting from the slight deterioration of the old-age dependency ratio.

▶ **Table 4.6. Financial projections of the GSIS pension accounts, 2021–2080** (in million €, where applicable)

Year	Contri-bution rate (%)	Total insurable earnings	Revenue			Total expenditure	Reserve (year-end)	Reserve ratio	PAYG rate (%)
			Contri-butions	Investment earnings	Total				
2021	19.2	9 538	1 856	30	1 886	1 686	8 183	4.9	17.7
2022	19.2	9 845	1 917	245	2 162	1 708	8 637	5.1	17.3
2023	19.2	10 605	2 064	253	2 317	1 791	9 163	5.1	16.9
2025	20.5	11 693	2 429	275	2 704	2 014	10 576	5.2	17.2
2030	21.8	14 314	3 164	317	3 481	2 685	14 163	5.3	18.8
2035	23.1	17 365	4 069	406	4 475	3 368	18 817	5.6	19.4
2040	24.4	21 061	5 222	540	5 762	4 327	24 985	5.8	20.5
2045	24.4	25 538	6 347	713	7 060	5 396	32 893	6.1	21.1
2050	24.4	30 988	7 727	895	8 622	7 051	40 993	5.8	22.8
2055	24.4	37 819	9 451	1 072	10 523	8 791	49 036	5.6	23.2
2060	24.4	45 721	11 448	1 255	12 704	11 228	57 162	5.1	24.6

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Year	Contribution rate (%)	Total insurable earnings	Revenue			Total expenditure	Reserve (year-end)	Reserve ratio	PAYG rate (%)
			Contributions	Investment earnings	Total				
2065	24.4	55 562	13 931	1 394	15 326	14 320	63 166	4.4	25.8
2070	24.4	67 659	16 955	1 494	18 450	17 365	67 704	3.9	25.7
2075	24.4	81 865	20 499	1 611	22 110	21 096	72 910	3.5	25.8
2080	24.4	99 069	24 785	1 717	26 502	25 676	77 565	3.0	25.9

Figure 4.4 presents, for each year until 2080, the total revenues of the GSIS, consisting of the amount of contributions and investment earnings, as well as GSIS expenditures. It shows that contributions are sufficient to support the scheme's expenditures for the projection period 2021-2061 and that investment earnings help compensate for contribution insufficiencies during 2062-2080, thus ensuring the maintenance of a constantly positive reserve.

Figure 4.5 shows the projected GSIS reserve ratio as compared to the minimum target reserve ratio (as defined in Section 2) over the period 2021-2080. The GSIS reserve ratio is constantly greater than the minimum target level in all years.

▶ **Figure 4.4. Projected GSIS revenues and expenditure and reserve ratio, 2021-2080**
   (in million €)
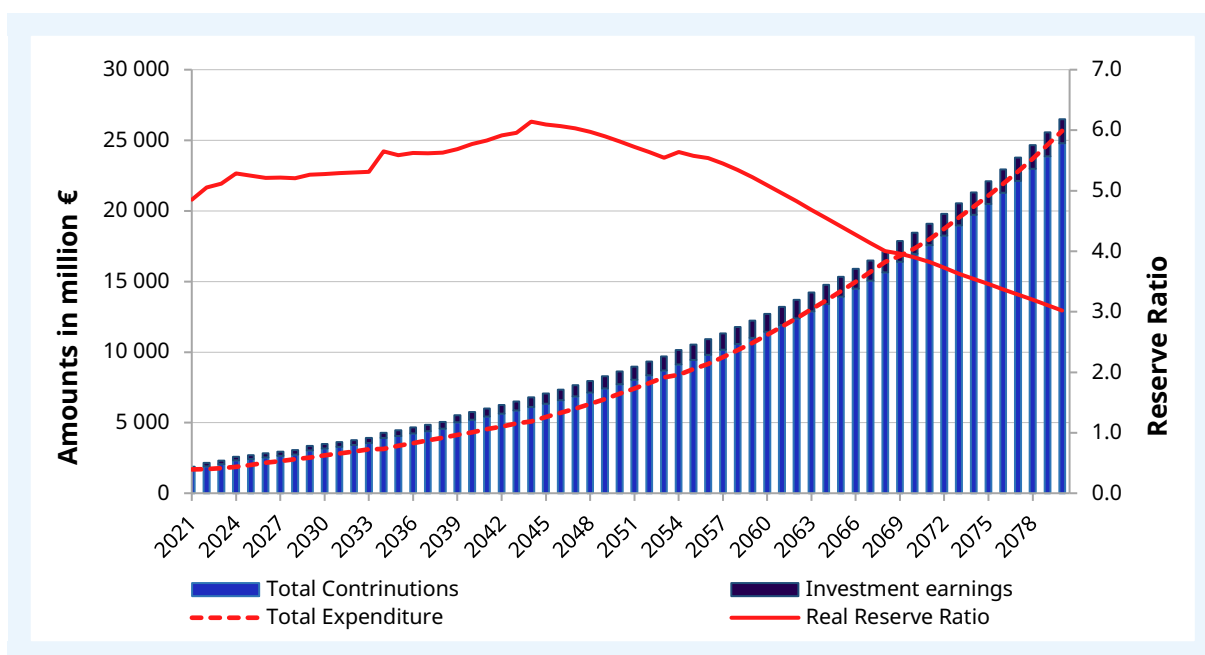
▶ **Figure 4.5. Projected GSIS reserve ratio compared to minimum target reserve ratio, 2021–2080**
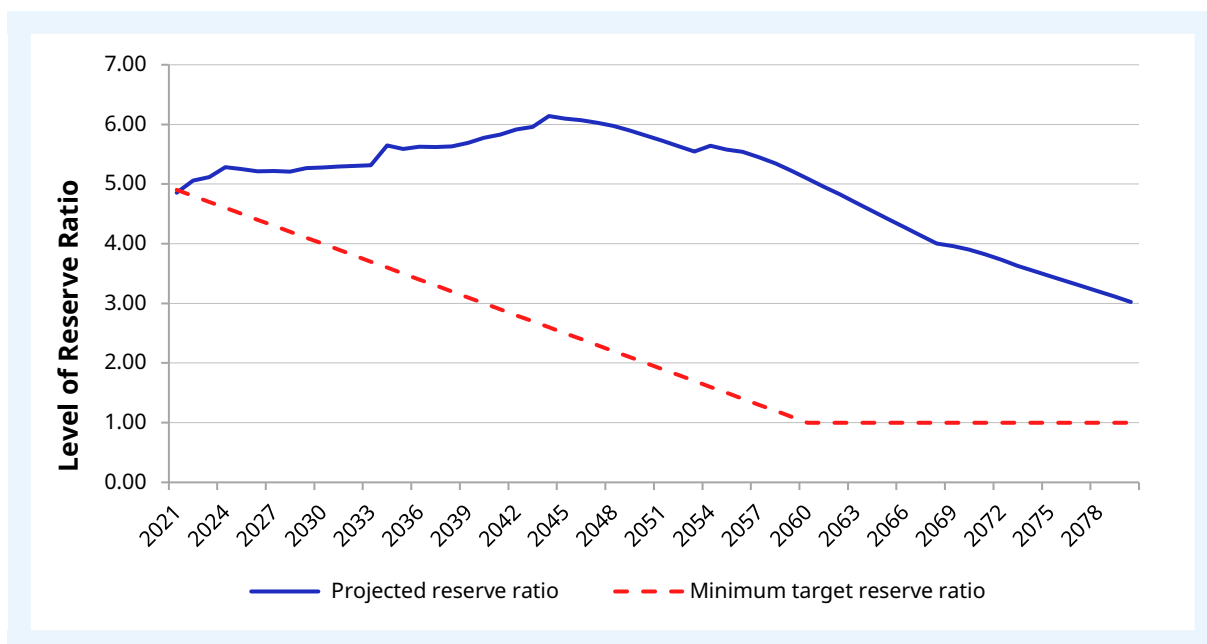
4.5. Recommendations

4.5.1. Investment policy

Even though the long-term financial sustainability of the GSIS is secured as illustrated in the above financial projection results of pension benefits, for the purposes of enhancing the financial governance of the GSIS and thus the security of GSIS members' benefits and inter-generational equity, it is recommended to set-up a strategic plan for revising the current investment policy of the GSIS.

Currently, GSIS assets are invested primarily in non-tradeable government deposits (98.6 per cent) while the remaining assets are invested in medium-term government bonds and cash deposits held with commercial banks in Cyprus.

The GSIS could consider the possibility of increasing the proportion of its assets invested in non-government securities to enhance diversification of the investment portfolio and to achieve higher rates of return through these diversified investments. Any revision of the investment policy should take into account the profile of the liabilities of the GSIS, subject to an acceptable level of risk. Achieving higher rates of return would directly contribute towards the improvement of the financial status of the GSIS through increased revenues. The extent of this improvement would eventually depend on the amount of investment in non-government assets and the additional investment return that could be achieved on those assets compared to the expected return under the current investment policy. Nevertheless, the financial improvement is not expected to be significant given that investment income, under current investment policy, is projected to represent, on average over the next 60 years, only 9.1 per cent of total revenues. It must be borne in mind that the main revenue source of the GSIS in the future will continue to be contributions.

Furthermore, investing in near future part of GSIS reserves in non-government assets would help in the containment of longer-term future increases of government debt towards the GSIS and would mean that, in future, government securities would represent a much smaller share of the total reserves. In that context, any cash flow needs of the GSIS in periods of significant economic difficulties can then be

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met by recovering funds (or selling securities) from any of the GSIS borrowers and not necessarily from the Government which might itself face cash flow problems at that time.

Any change in the current investment policy of the GSIS should be gradual to avoid a negative impact on government cash flows and a deterioration of its budgetary position, as well as to allow time for the implementation of the new investment framework of the GSIS.

The actual percentage of future GSIS surpluses to be invested in non-government securities each year should be decided in close cooperation with the Ministry of Finance in the context of government finances, and by considering the impact of public social protection programmes, including the GSIS, on the government budget.[5] It is noted that according to the Social Insurance Law, the Minister of Finance is currently responsible for setting up the investment policy of the GSIS, while the Social Insurance Board has an advisory role on investments.

Finally, the new investment policy and strategy should:

- o be consistent with the financing objectives of the GSIS, the maturity status of the GSIS and its future cash flow requirements,

- o aim to achieve a reasonable balance between the two primary investment objectives of security of asset and return on investments, and

- o take into account the national economic and social utility of the investments and consider the extent to which those investments make a substantial contribution to the long-term national growth rates.

By contributing to long-term national economic growth, the chosen investments can improve the financial status of the GSIS by affecting positively the number of workers and the amount of their insurable earnings. Indeed, social security schemes are primarily dependent, in the long term, on the evolution of economic growth.

4.5.2. Financing policy

Further to the establishment of an investment policy, for the purposes of enhancing the financial governance of the GSIS, the security of benefits and the intergenerational equity, it is also recommended that the Government establishes a written financing policy. The financing policy establishes a series of rules applying to contributions and/or benefits to ensure that social security benefits will be funded in an equitable and sustainable manner.

More specifically, a financing policy for the GSIS would define financing objectives and time horizons, assess current and future financial risks faced by the GSIS and the uncertainty of results, as well as make the necessary provisions to ensure maintaining adequate reserve levels to attain the stability of the financing on a long-term basis. In addition, it is important to ensure that the adoption of a funding policy coherent and well supported by the investment policy.

The GSIS financing policy would include:

- A **contribution rate schedule** that guarantees the collection of sufficient revenues (contributions and government subsidies) to support the payment of promised benefits for the next 60 years. *The law already specifies a contribution rate schedule (gradually increasing contribution rates until 2039, and ultimate contribution rate thereafter). Projections show that this*

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[5] The European Commission's recent forecasts, as per Spring 2023 Economic Forecast, project that the general government gross debt is expected to continue decreasing, to 72.5 per cent of GDP in 2024.

level of contributions can support benefit expenditures until 2080. This contribution rate schedule needs to be confirmed at each actuarial valuation.

- **A minimum target reserve ratio** having two objectives:

1. Ensuring that unfavourable future demographic and/or economic conditions do not jeopardize future benefit payments. Sensitivity tests show how certain factors (risks) may affect the results of the valuation, and either (1) reduce the security of future benefit payments, or (2) force the contribution rates to increase to levels higher than provided under the law. In that context, a long-term reserve objective needs to be part of the financing policy. *A minimum target reserve ratio at 1.0 time the annual scheme's expenditures is presently established. An additional sensitivity test could be realised to illustrate the effect of an economic recession on the GSIS reserve level, and guide on the establishment of a minimum target reserve ratio that would prevent an economic downturn from exhausting the reserve of the scheme when the scheme will be mature.*

2. Ensuring the stability of the contribution rates after 2039 to limit inter-generational transfers. The determination of a minimum target reserve ratio applicable after 2060 is necessary to ensure the stability of the contribution rate in the long term. *The actuarial valuation presently covers a period of projection of 60 years, which does not ensure that the contribution rate schedule provided under the law is adequate to ensure the stability of the contribution rate in the very long term. Such a financing criterion would require that the period of projection of the actuarial valuation be extended beyond 60 years.*

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▶ 5. Reconciliation with the previous valuation

5.1. Introduction

The results presented in this report were reconciled with those previously projected in the actuarial valuation as at 31 December 2017, to determine the effects of the changes that affect the projections. The indicator used for the reconciliation is the pay-as-you-go (PAYG) rate, which is the ratio of expenditures to insurable earnings in a given year and corresponds to the contribution rate that would need to be paid to cover the cost of the GSIS if there were no reserves.

The sources of difference of results observed at the two valuation dates, which are discussed below, are separated as:

- o amendments in the Social Insurance Law and other relevant laws,
- o methodological improvements made to the projection model,
- o GSIS experience for years 2018, 2019 and 2020 affecting the starting data of the report as at 31 December 2020, and
- o changes made to the key actuarial assumptions.

5.2. Amendments to the legislation

There were two amendments to the legal provisions of the GSIS since the last actuarial valuation. These amendments refer to: (1) the Social Insurance Law No. 126(I) of 2019, which was enacted on 5 August 2019 with retroactive effect as of 1 January 2018 and stipulates the payment of widower's pensions to men under the same conditions as for women who lose their husbands, and (2) the Social Insurance Law No. 126(I) of 2019 which stipulates the dependants' supplement for female beneficiaries.

5.3. Methodological improvements to the projection model

In principle, there were no methodological changes to the pension projection model used for the previous actuarial valuations.

5.4. Experience update, 2018–2020

The projections made in the 2017 actuarial report were compared with the results published in the financial statements for the years 2018, 2019 and 2020, as shown in Annex 3 of this report. Those results were adjusted so that they could be presented on the same basis as those of the present actuarial report, that is by assuming that expenditure amounts are disbursed as soon as they are encumbered, and contribution amounts are received as soon as they are due.

Table 5.1 shows the results of that comparison. Each element in the table is analysed in the pages which follow.

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▶ **Table 5.1. Changes in GSIS reserves, 2017–2020**

	(A) **Actual** (in millions €)	(B) **Expected** (in millions €)	(C)=(A)-(B) **Difference** (in millions €)	(C)/(B) **Deviation** (%)
Reserves as at 31 December 2017	7 395	7 395	0	0.0
Plus contributions	4 739	4 618	120	2.6
Plus investment income[1]	32	45	–13	–29.0
Minus expenditures	4 181	4 230	–49	–1.1
Reserves as at 31 December 2020	7 983	7 829	155	2.0

Note: [1] The expected amount of investment income of €45 million is based on the total reserves of the GSIS as of 31 December 2017 and the expected rates of return shown in table 5.3.

5.4.1. Contributions

The total amount of contributions collected during the period 2018–2020 was approximately €4,739 million or 2.6 per cent higher than projected in the 2017 actuarial valuation. This difference is mainly due to a higher-than-expected number of contributors, resulting from a higher-than-expected level of employment in the years 2018 and 2019. In 2020, the number of contributors was lower than expected mainly due to a lower-than-expected level of employment as a result of the COVID-19 pandemic. As shown in table 5.2, the number of contributors in years 2018 and 2019 was 501,446 and 518,165 respectively, which is higher than the number projected in the 2017 valuation by 20,527 for 2018 and 13,149 for 2019, a difference of 4.3 per cent for 2018 and 2.6 per cent for 2019. In 2020, the number of contributors dropped to 493,713, that is 23,877 lower than the number projected in the 2017 valuation, a difference of 4.6 per cent. Over the period 2018-2020, the total number of contributors increased by 4.5 per cent from 472,527 in 2017 to 493,713 in 2020, representing an average annual rate of 1.5 per cent. By contrast, over the same period the corresponding expected increase was 9.5 per cent from 472,527 in 2017 to 517,590 in 2020, representing an average annual rate of 3.1 per cent.

▶ **Table 5.2. Actual vs expected annual increase of contributors, 2017–2020** (numbers and percentages)

Year	Actual		Expected	
	Number	**Increase** (%)	**Number**	**Increase** (%)
2017	472 527	–	472 527	–
2018	501 446	6.1	480 919	1.8
2019	518 165	3.3	505 016	5.0
2020	493 713	–4.7	517 590	2.5

5.4.2. Investment income

Over the period 2017 to 2020, total income from investments was €32 million, 29 per cent lower than anticipated, primarily due to the continued low level of the European Central Bank interest rates, providing support to the real economy.

Table 5.3 compares the assumed nominal rates of return on GSIS assets with the rates observed from 2018 to 2020. During that period, the average annual rate of return on GSIS assets was 0.1 per cent, whereas the expected rate was 0.2 per cent.

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▶ **Table 5.3. Nominal rate of return on GSIS assets, 2018–2020** (percentages)

Year	Actual rate of return	Expected rate of return
2018	0.2	0.2
2019	0.1	0.2
2020	0.1	0.3
Average rate	**0.1**	**0.2**

5.4.3. Expenditure

Benefit payments during the period 2018-2020 were €49 million lower than anticipated, representing a deviation from the expected results of -1.1 per cent. As shown in table 5.4, the total number of pensions in payment in 2020 was 159,765, that is 4,032 less than the number projected in the 2017 actuarial valuation, a difference of 2.5 per cent. Over the period 2017-2020, the total number of pensions in payment increased steadily by 6.7 per cent from 149,762 in 2017 to 159,765 in 2020, representing an average annual rate of 2.2 per cent. By contrast, over the same period the corresponding expected increase was higher, at 9.4 per cent, from 149,762 in 2017 to 163,797 in 2020, representing an average annual rate of 3.0 per cent.

▶ **Table 5.4. Actual vs expected annual increase of pensioners, 2017–2020** (numbers and percentages)

Year	Actual		Expected	
	Number	**Increase** (%)	**Number**	**Increase** (%)
2017	149 762	–	149 762	–
2018	152 122	1.6	153 840	2.7
2019	156 378	2.8	158 453	3.0
2020	159 765	2.2	163 797	3.4

5.5. Changes in assumptions

Table 5.5 summarizes the changes made to the key assumptions used in this report compared with those used in the previous report. These changes are as follows:

- The *total fertility rate* starts at a higher level than in the previous actuarial report, but by 2080 reaches at a lower level. In the 2017 actuarial valuation, the rate was increasing gradually from 1.34 children per woman in 2021 to 1.58 children per woman in 2080. In this report, the fertility rate is 1.37 children per woman in 2021, increasing gradually to 1.55 children per woman in 2080.

- In this report, the *life expectancies* for both males and females are assumed to reach 87.7 and 91.2 years respectively in 2080. These life expectancies are higher by half a year than those projected in the 2017 valuation, which were assumed to reach 87.3 years for males and 90.6 years for females in 2080.

- In the 2017 valuation, net migration was 6,634 in 2021 gradually increasing to 7,620 in 2050 and thereafter decreasing to 5,500 in 2080. In this valuation, net migration increases from 4,493 in 2020 to 7,448 in 2021 and continues increasing up to 2025 and then remains relatively stable up to 2030, with an average of 9,048 over the period 2022-2030. From 2031-2050 net migration gradually decreases to 7,800 in 2050 and 5,800 in 2080.

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- The assumed overall *male labour force participation rate* (15-64) is much higher in the present valuation compared to the 2017 valuation, whereas the *female labour force participation rate* is slightly different from the previous valuation. In the previous report, the male labour force participation rate of 79.9 per cent in 2021 was projected to reach 80.7 per cent in 2080. For females, it was 71.7 per cent in 2021, increasing to 76.1 per cent in 2080. In the present report, the male labour force participation rate of 82.7 per cent in 2021 is projected to reach 84.2 per cent in 2080. For females, it is 71.0 per cent in 2021, increasing to 76.4 per cent in 2080.

- In this report, the *unemployment rate* (15-64) is assumed to gradually decrease from 7.6 per cent in 2021 to 6.5 per cent in 2030, to continue decreasing at a slower pace to reach to 6.2 per cent in 2050 and to 5.7 per cent in 2080, whereas in the previous report it was assumed to decrease from 6.2 per cent in 2021 to 6.0 per cent in 2030 and to 5.3 per cent in 2068, remaining stable thereafter.

- In this report, the assumed annual *real rate of return* on GSIS assets in the long term is set at 0.25 per cent from 2031 onwards, whereas in the 2017 report it was set at 0.5 per cent from 2030 onwards.

Some other GSIS-specific assumptions, which are described in Annex 4, were also changed. In particular, the assumed *invalidity incidence rates for males and females* are lower in the present valuation compared to the 2017 valuation by a factor of 43 per cent and 39 per cent respectively.

▶ **Table 5.5. Changes to key assumptions: 2020 versus 2017 actuarial valuations**

Assumption	Year	Actuarial report as at 31.12.2020		Actuarial report as at 31.12.2017	
Total fertility rate	2021	1.37		1.34	
	2050	1.47		1.47	
	2080	1.55		1.58	
		Males	**Females**	**Males**	**Females**
Life expectancy at birth	2021	80.1	84.1	80.7	84.6
	2050	84.4	88.0	84.3	87.8
	2080	87.7	91.2	87.3	90.6
Net migration	2021	7 448		6 634	
	2050	7 800		7 620	
	2080	5 800		5 500	
Real GDP growth rate (%)		6.6 (2021)		2.7 (2021)	
		1.9 (2030+)		2.0 (2030+)	
		Males	**Females**	**Males**	**Females**
Labour force participation rates (15-64) (%)	2021	82.7	71.0	79.9	71.7
	2050	84.0	74.7	80.8	75.4
	2080	84.2	76.4	80.7	76.1
Unemployment rate (15-64) (%)	2021	7.6		6.2	
	2030	6.5		6.0	
	2050	6.2		5.9	
	2080	5.7		5.3	
Price inflation (%)		2.0 (2027+)		2.0 (2023+)	

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Assumption	Year	Actuarial report as at 31.12.2020	Actuarial report as at 31.12.2017
Real wage increase (%)	2021	−1.0	0.8
	2050	1.2	1.3
	2080	1.6	1.8
Real rate of return (%)		0.25 (2031+)	0.5 (2030+)

5.6. Reconciliation results

Table 5.6 shows the results of the reconciliation between the previous actuarial valuation and present valuation. It shows the effect of the various factors on the PAYG rates.

Amendments: The amendment to the legislation regarding widower's pension, which was enacted on 5 August 2019 with retroactive effect as of 1 January 2018, had the effect of increasing the PAYG rates by 0.2 per cent in 2021 and increasing them by 0.8 per cent in 2050 and 2080 respectively.

Experience update: The experience update (2018-2020) had the effect of increasing the PAYG rates by 1.2 per cent in 2021, decreasing by 1.0 per cent in 2050 and increasing by 0.6 per cent in 2080.

Changes in assumptions: The overall impact of changes to the projection assumptions had the effect of decreasing the PAYG rate by 1.4 per cent in 2021, by 0.1 per cent in 2050 and by 1.2 per cent in 2080.

- Concerning demographic assumptions, the significantly higher net migration projected over the short and medium term in the 2020 valuation causes a small decrease of the PAYG rate in the short term and much higher decrease in the long term.

- Concerning economic assumptions, the favourable assumptions of the 2020 valuation primarily with regards to the higher male labour force participation rates over the whole projection period, higher nominal wage increases (due to higher inflation rate) and higher real GDP growth in the short-term lead to a noticeable decrease of the PAYG rate, particularly over the period 2021-60. On the contrary, the less favourable assumptions projected in the 2020 valuation over the medium and long term, primarily with regards to the lower unemployment rate, increased the PAYG rate towards the end of the projection period.

- Concerning scheme-specific assumptions, the less favourable assumption in the 2020 valuation regarding the time at which the increases in the statutory pensionable age are anticipated to incur leads to increases in the PAYG rate over the period 2025–2070, with the most significant to be over the period 2040-2068. More specifically, under 2020 actuarial valuation, increases in the statutory pensionable age are expected to incur in the years 2034, 2044, 2054 and 2069 while under 2017 valuation increases in the pensionable age were expected to incur earlier, i.e., in the years 2029, 2039, 2049 and 2060. On the contrary, the lower invalidity incidence rates in the 2020 valuation partially offset the above increases over the period 2025–2070, while leads to a reduction in the PAYG rate in the last decade of the projection.

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▶ **Table 5.6. Reconciliation of the PAYG rates between 2017 and 2020 actuarial valuations**

	2021	2050	2080
As per actuarial report as at 31 December 2017	17.7	23.0	25.7
I. Amendments	**+0.2**	**+0.8**	**+0.8**
II. Experience update, 2018–2020	**+1.2**	**–1.0**	**+0.6**
III. Improvements in methodology	**+0.0**	**+0.0**	**+0.0**
IV. Changes in assumptions			
Demographic	–0.1	–0.9	–1.7
Economic	–1.1	–0.9	+0.6
Scheme–specific	–0.2	+1.7	–0.2
Subtotal	**–1.4**	**–0.1**	**–1.2**
Total of I to IV	**–0.0**	**–0.3**	**+0.2**
As per actuarial report as at 31 December, 2020	**17.7**	**22.8**	**25.9**

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▶ 6. Sensitivity tests and adverse scenario

Since all projections have a degree of uncertainty, a number of sensitivity tests and an adverse scenario were carried out on the results. These tests and the adverse scenario were used to measure the changes in the results that would occur if changes in assumptions were different than those made in the base scenario.

The sensitivity tests were limited to the following five key demographic and economic variables which are subject to a relatively high degree of uncertainty:

- *Demographic*: fertility, mortality and net migration.

- *Economic*: female labour force participation rates and the real rate of return on GSIS assets.

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

The adverse scenario examines the sensitivity of base scenario results in case of simultaneous unfavourable changes in both demographic and economic assumptions. The changes concern:

- *Demographic*: net migration.

- *Economic*: labour force participation rates, unemployment rate, real GDP growth, employment growth and productivity growth.

To examine the degree of sensitivity of projected results to changes in the adverse scenario and the sensitivity test assumptions, three financial indicators are presented for each test, the values of which are compared with those in the base scenario. These indicators are:

- *general average premium (GAP)*: the stable contribution rate needed to be paid over the projection period in respect of current and future insured population in order to finance GSIS expenditure over the same period in respect of existing and future beneficiaries,

- *reserve ratio*: the ratio of the level of reserves at the end of one year to the level of expenditures for the same year, and

- *pay-as-you-go (PAYG) rate*: the ratio of expenditure to total insurable earnings in a given year.

A less favourable change in an assumption (Test I) typically results in a lower reserve ratio and a higher GAP, as well as a higher PAYG rate. A more favourable change (Test II) has the opposite effect.

Tables 6.1 and 6.2 summarize the alternative assumptions used in the sensitivity tests and the adverse scenario respectively. This is followed by a brief discussion of each sensitivity test assumption and the adverse scenario, as well as the impact that the variation in each assumption and the variation of the adverse scenario has on projection results. Tables 6.3 and 6.4, presented at the end of this section, show the values of the above three financial indicators for each sensitivity test and for the adverse scenario respectively.

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▶ **Table 6.1. Sensitivity test assumptions**

Assumption		Test I (unfavourable)		Best estimate assumptions in the report		Test II (favourable)	
Total fertility rate	2050	1.39		1.47		1.54	
	2080	1.40		1.55		1.70	
		Males	**Females**	**Males**	**Females**	**Males**	**Females**
Life expectancy at birth	2050	85.4	89.1	84.4	88.0	83.4	87.1
	2080	89.7	93.2	87.7	91.2	85.7	89.2
Net migration	2050	6 052		7 800		9 414	
	2080	4 500		5 800		7 000	
Female labour force participation rate (15–64) (%)	2050	73.0		74.7		76.4	
	2080	73.4		76.4		79.4	
Real rate of return (%)		0.0 (2030+)		0.25 (2031+)		0.5 (2031+)	

▶ **Table 6.2. Adverse scenario assumptions**

Assumption	Adverse scenario assumptions		Best estimate assumptions in the report	
Net migration				
2030	8 910		8 910	
2040	7 705		8 355	
2050	6 500		7 800	
2080	5 500		5 800	
Labour force participation rate (15-64) (%)	**Males**	**Females**	**Males**	**Females**
2030	83.9	74.2	83.9	74.2
2040	82.9	73.2	83.9	74.4
2050	81.9	72.2	84.0	74.7
2080	82.0	73.0	84.2	76.4
Unemployment rate (15–64) (%)				
2030	6.5		6.5	
2040	6.3		6.3	
2050	6.2		6.2	
2080	6.3		5.7	
GDP growth (real) (%)				
2030	1.9		1.9	
2040	1.5		1.9	
2050	1.5		1.9	
2080	1.5		1.9	

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Assumption	Adverse scenario assumptions	Best estimate assumptions in the report
Employment growth (15-64) (%)		
2030	1.0	1.0
2040	0.8	0.9
2050	0.2	0.6
2080	0.3	0.3
Productivity growth (real) (%)		
2030	0.9	0.9
2040	0.7	1.0
2050	1.1	1.2
2080	1.2	1.6

6.1. Sensitivity tests of demographic assumptions

6.1.1. Fertility

In this actuarial report, the total fertility rate is assumed to gradually increase from 1.37 children per woman in 2021 to 1.47 in 2050 and to 1.55 in 2080.

A change in the fertility rate, and consequently in the number of births, results in a change in the number of new GSIS contributors around 25 years later. Therefore, the effect of a variation in fertility on the projected financial situation of the GSIS can be observed only in the long term.

In Test I (unfavourable), the assumed fertility rate is lower than that used in the report. It increases at a slower pace than the base scenario, reaching 1.39 in 2050 and 1.40 in 2080. In Test II (favourable), it increases more rapidly, reaching 1.54 in 2050 and 1.70 in 2080.

In 2080, the cumulative effect of the fertility rate results in a reduction of 2.0 per cent of the number of contributors in Test I and an increase of 2.1 per cent in Test II.

6.1.2. Mortality

In the present report, it is assumed that the life expectancy at birth gradually increases during the projection period, reaching 87.7 years for males and 91.2 years for females in 2080.

The sensitivity tests apply variations in the level of improvement in life expectancy or mortality reduction during the projection period. An improvement in life expectancy that is greater than the improvement assumed in the base scenario would typically increase the aggregate benefit amount because the pension benefit payments would be made over a longer period. Similarly, a smaller improvement in life expectancy would typically reduce the aggregate benefit amount. However, the above anticipated change in the aggregate benefit amount due to an increase or decrease in life expectancy is effectively offset by opposite-sign contribution stemming from the anticipated increase in the effective retirement age resulting from the linkage of retirement age and life expectancy.

Test I (unfavourable) assumes a higher life expectancies compared with the base scenario. Life expectancy at birth would thus be 89.7 years for males and 93.2 years for females in 2080. That represents an increase of two years for each gender compared with the base scenario. Test II (favourable), on the other hand, assumes a shorter life expectancy of 85.7 for males and 89.2 years for females in 2080, representing a reduction of two years for each gender compared with the base scenario.

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As expected, the sensitivity of the results to a change in life expectancy is relatively limited. In 2080 under Test I (unfavourable), the aggregate GSIS expenditure increases by 2.1 per cent, whereas under Test II (favourable) it decreases by 2.5 per cent.

6.1.3. Net migration

The best-estimate projections of the report assume that net migration increases from 4,493 in 2020 to 7,448 in 2021 and continues increasing up to 2025 and then remain relatively stable up to 2030, with an average of 9,048 over the period 2022-2030. From 2031-2050 net migration gradually decreasing to 7,800 in 2050 and thereafter decreasing to 5,800 in 2080.

A change in net migration results in a change in the number of new contributors to the GSIS. Over a longer term, the number of beneficiaries also changes.

In Test I (unfavourable), the assumed net migration decreases to 6,052 people in 2050 and thereafter progressively decreases to 4,500 in 2080. That represents an average decrease of 1,706 people in the annual number of net migrants over the period 2021-2080 compared with the base scenario. Test II (favourable), on the other hand, assumes higher levels of net migration, that is, 9,414 in 2050 and 7,000 in 2080, representing an average increase of 1,575 net migrants per year during the period 2021–2080 compared with the base scenario.

According to Test I, the number of contributors decreases by 11.1 per cent in 2080, compared with the base scenario, whereas in Test II, the number of contributors increases by 10.2 per cent.

6.2. Sensitivity tests of economic assumptions

6.2.1. Female labour force participation rate

The present report assumes that the average labour force participation rate for females between 15 and 64 increases from 71.0 per cent in 2021 to 74.7 per cent in 2050 and thereafter reaches 76.4 in 2080.

A downward change in female labour force participation rates (Test I) affects employment, given that the rate of unemployment remains unchanged from the base scenario. This decrease results in a reduction in the number of female contributors of the GSIS and in the aggregate amount of benefits over the longer term. An upward change in activity on the labour market (Test II) has the opposite effect.

In Test I (unfavourable), the assumed female participation rate progressively increases to 73.0 per cent in 2050, and thereafter reaches 73.4 in 2080, 1.7 and 3 percentage points lower than the best-estimate rate of the base scenario for those years. By contrast, in Test II (favourable), the assumed female participation rate gradually increases from to 76.4 per cent in 2050, reaching 79.4 per cent in 2080, which is 1.7 and 3 percentage points higher than the best-estimate rate of the base scenario for those years.

According to Test I, the female employed population declines by 3.9 per cent by 2080, compared with the base scenario, whereas in Test II the female employed population increases by 3.9 per cent by 2080.

6.2.3. Real rate of return

The projected real rate of return on the GSIS of the base scenario is assumed to progressively increase to its ultimate level of 0.25 per cent in 2031, and thereafter remain constant.

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

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In Test I (unfavourable), the real rate of return is assumed to be lower than in the base scenario and results in lower investment income levels. The ultimate level of real rate of return is 0.0 per cent and is reached in 2031. In Test II (favourable), the real rate of return is assumed to be higher than in the base scenario, reaching its ultimate level of 0.5 per cent in 2031.

Because of the cumulative effect of the above rate of return changes on the reserve, in Test I investment income decreases by 15 per cent in 2050 and 21 per cent in 2080 compared with the base scenario. In Test II, investment income increases by 16 per cent in 2050 and 25 per cent in 2080 compared to the base scenario.

6.3. Adverse scenario

The present actuarial valuation is based on the prevailing demographic and economic conditions and expectations about Cyprus' population and economy as of December 2020, taking into account the relevant EU Commission's Economic Forecast on the measures of GDP growth, CPI, wage growth and unemployment rate, as presented in Chapter 3.

As shown in table 6.2, compared to base scenario, this scenario assumes that after 2030 there will be a shrink of the economy having the following effects:

- *Demographic*: shrink on all industries activities so fewer jobs will be available and thus the net migration will significantly decrease.

- *Economic*: shrink on all industries activities so fewer jobs that results to a decrease in the labour force participation rates, to a lower level of employment and increase of the unemployment. Moreover, a shrink of the economy will cause a prolonged lower real GDP growth rate over the period 2030–2080.

The simulation of the adverse scenario shows that, even though the projected financial status of the GSIS is sensitive to the above changes, the reserve remains constantly positive while the ratio of the reserve over annual expenditure reaches 1.3 at 2080.

▶ **Table 6.3. Results of sensitivity tests**

Assumption	Test	General average premium (%)	Reserve ratio		Pay-as-you-go rates	
			2050	**2080**	**2050** (%)	**2080** (%)
Best-estimate assumptions of the report		20.8	5.8	3.0	22.8	25.9
Fertility	**Test I**	20.9	5.8	2.8	22.8	26.5
	Test II	20.7	5.8	3.3	22.7	25.4
Mortality	**Test I**	20.9	6.0	2.7	21.9	26.3
	Test II	20.8	6.0	3.2	22.5	25.4
Net migration	**Test I**	21.8	4.9	1.4	24.2	26.8
	Test II	20.0	6.6	4.4	21.6	25.3
Female labour force participation rate	**Test I**	21.0	5.7	2.7	22.9	26.1
	Test II	20.6	5.9	3.3	22.6	25.7
Real rate of return on GSIS assets	**Test I**	21.0	5.6	2.7	22.8	25.9
	Test II	20.6	6.1	3.4	22.8	25.9

▶ **Table 6.4. Results of the adverse scenario**

Assumption	General Average Premium (%)	Reserve ratio		Pay-as-you-go rates	
		2050	**2080**	**2050** (%)	**2080** (%)
Best-estimate assumptions	20.8	5.8	3.0	22.8	25.9
Adverse scenario assumptions	21.9	5.5	1.3	23.8	28.1

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▶ 7. Conclusion

This actuarial report shows that the legislated schedule of contribution rates, following the 2009 and 2012 social insurance reforms, is sufficient to ensure the financial sustainability of the long-term benefits branch of the GSIS over the period 2021 to 2080. The projected financial status of the GSIS is healthy, with the reserve ratio of the GSIS remaining at a level of three times the annual expenditure until the end of the projection period.

It is recommended that the Government eventually introduces the necessary strategic changes for adapting its investment policy so that the proportion of GSIS assets invested in non-government securities increases. The revision of the investment policy is necessary for the sound financial governance of the GSIS.

To enhance the financial governance of the GSIS, the security of benefits and the intergenerational equity, it is recommended that the Government establishes a written financing policy for specifying financing objectives and time horizons, assessing future financial risks faced by the GSIS and the uncertainty of results, and making the necessary provisions to ensure the stability of the financing on a long-term basis.

With respect to the unemployment benefit and other short-term benefits of the GSIS, a regular monitoring of the financial performance of the Unemployment Account as well as the Other Benefits Account is necessary.

The projected financial status of the GSIS presented in this report is based on an assumed long-term demographic and economic framework. Therefore, it remains important to review the GSIS financial position on a regular basis by producing periodic actuarial valuations. As required by the Social Insurance Law, the next actuarial report is scheduled to be produced as at 31 December 2023.
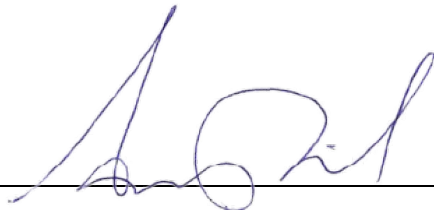
▶ 8. Actuarial opinion

In our opinion, this actuarial report, which was prepared in compliance with the provisions of section 76 of the Social Insurance Law No. 59(I)/2010:
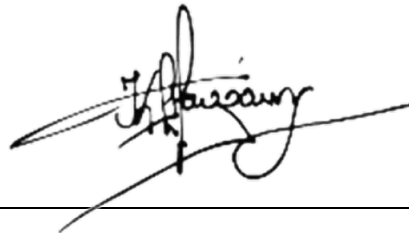
- o is based on data that are sufficient and reliable;
- o uses assumptions that are, individually and in aggregate, reasonable and appropriate; and
- o employs a methodology that is appropriate for the purposes of this report and consistent with sound actuarial principles.

The report and opinions given in it are in accordance with internationally accepted actuarial practice as provided by the International Standards of Actuarial Practice for General Actuarial Practice (ISAP 1) and Financial Analysis of Social Security Programs (ISAP 2) of the International Actuarial Association.
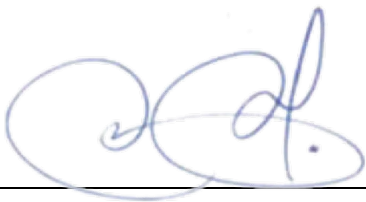
On behalf of the ILO:

André Picard FSA, FCIA   **Costas Stavrakis FIA, FCAA**

Pierre Plamondon, FSA, FCIA

▶ Annex 1. Overview of the legal provisions of the General Social Insurance Scheme

A1.1. Introduction

The information presented in this annex is valid as at 31 December 2020, the date of the actuarial valuation of the GSIS. Any amendments in the legislation after the above date are not shown.

It is noted that the following amendments of the GSIS, as a result of the last major GSIS pension reform and the respective enactment of the Social Insurance Law, No. 193(I) of 2012, were incorporated in the present actuarial valuation:

- As of 1 January 2013, actuarial reduction of pension entitlements from the GSIS by 0.5 per cent per month for retirements before the statutory retirement age in line with the planned increase in the minimum age for entitlement to an unreduced pension to reach 65 (by 6 months per year), between 2013 and 2016;

- Increase of contributions, as of 1 January 2014, of salaried employees and employers to the GSIS by an additional 1 percentage point (p.p.) of the increase which was legislated to take effect in 2014 as per 2009 GSIS reform – the above increase is shared as follows: 0.5 p.p. from salaried employees and 0.5 p.p. from employers and 1 p.p. in the case of self-employed persons; and

- Introduction of an automatic adjustment of the statutory retirement age every 5 year in line with changes in life expectancy at the statutory retirement age, to be applied in 2018 and the first revision will cover the period 2018–2023.

In addition, according to the Social Insurance Law No. 126(I) of 2019, which was enacted on 5 August 2019 with retroactive effect as of 1 January 2018 the introduction of payment of widower's pensions to men under the same conditions as for women who lose their husbands, and the introduction of the dependants' supplement for female beneficiaries.

A1.2. Historical context

The first Social Insurance Scheme in Cyprus was introduced in January 1957. It covered compulsorily the employed persons, with the exception of certain agricultural workers. The self-employed persons and employed workers excepted from compulsory insurance were given the right to be insured voluntarily. The benefits of the 1957 scheme were: marriage grant, maternity grant, funeral grant, sickness benefits, unemployment benefits, old-age pension, widow's pension and orphan's benefits.

In October 1964, compulsory insurance was extended to every person gainfully employed in Cyprus, including the self-employed, and the material scope was expanded to include the maternity allowance and employment injury benefits.

In January 1973, invalidity pension was introduced for persons permanently incapable of work. Sickness benefits were extended to self-employed persons and married women, and unemployment benefits were extended to married women.

The invasion of Cyprus by Turkey in July 1974 made necessary certain restrictive measures for safeguarding the scheme against the risk of bankruptcy. Such measures included the reduction of pension rates and the suspension of the rights to unemployment and certain other benefits. The July 1974 levels were restored in 1977. Thereafter, the rates of benefit were increased from time to time

since 1978 and a new benefit was introduced, the missing person's allowance, payable to wives and eligible children of persons missing as a result of the Turkish invasion.

On 6 October 1980, the supplementary part of the GSIS was introduced. This new part of the GSIS is earnings-related.

A1.3. Coverage

The GSIS covers compulsorily every person gainfully occupied in Cyprus, either employed or self-employed. Employed persons are entitled to all benefits. Self-employed persons are not entitled to unemployment benefit and employment injury benefits.

Voluntary contributors working abroad for Cypriot employers are entitled to all benefits apart from employment injury benefits. Other voluntary contributors are entitled only to maternity grant, funeral grant, old-age pension and survivors' benefits.

A1.3.1. Voluntary insurance

Voluntary insurance is allowed to persons who:

- o wish to continue insurance after a prescribed period of compulsory insurance; or
- o work abroad in the service of Cypriot employers.

The condition for continuation of insurance on a voluntary basis is that the person concerned has basic insurance of at least one insurance point, earned from paid contributions.

Persons working abroad in the service of Cypriot employers are allowed to be insured without any condition as to previous insurance. The application for voluntary insurance must be submitted within 12 months from the end of the contribution year for which voluntary contributions are to be paid.

A1.4. Contributions

A1.4.1. Age conditions

Liability for the payment of contributions starts at 16 and ceases at the pensionable age. However, an insured person who attains the pensionable age and does not satisfy the insurance conditions for old-age pension must continue to pay contributions until satisfaction of the insurance conditions. In no case can contributions be paid after the age of 68.

A1.4.2. Insurable earnings

Insurable earnings, on which contributions are paid, are the gross earnings up to a maximum of six times the basic insurable earnings. In 2020, basic insurable earnings are fixed at €175.90 per week, or €9,566 per year. The maximum insurable earnings for contribution purposes in 2020 are €54,860.

The total annual insurable earnings of every insured person are converted into insurance points. The conversion of insurable earnings into insurance points is done by dividing the earnings of a given year by the annual basic insurable earnings of the given year (in 2020, one point is credited for every €9,566 of earnings). The first insurance point represents *basic insurance* and insurance points in excess of one represent *supplementary insurance*.

For self-employed persons, insurable earnings are fixed by regulations according to occupational category. For each category of self-employed persons, a compulsory minimum insurable (notional) income is prescribed, but the individual self-employed person has the right to opt for a higher income

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up to the maximum insurable earnings or apply for contribution payments on the actual income, if that is lower that the notional income.

A1.4.3. Contribution rate

Table A1.1 shows the current contribution rate paid by or on behalf of insured persons.

▶ **Table A1.1. Contribution rates in force as at 31 December, 2020**

Employed persons	16.6 per cent of insurable earnings, shared equally between the employer and the employee
Self-employed persons	15.6 per cent of insurable income
Voluntary contributors working abroad for a Cypriot employer	16.6 per cent of insurable earnings, as agreed in the contract of employment
Other voluntary contributors	14.0 per cent of an amount of earnings they fix, not exceeding the value of insurance points obtained in the previous year, or the average value of insurance points obtained over the last three years if higher
National guard	1.25 per cent of the basic insurable earnings paid by state
State contribution	4.9 per cent of the insurable earnings of employed persons, self-employed and voluntary contributors working abroad, and 4.1 per cent of insurable earnings of other voluntary contributor

In case of delay in the payment of contributions by an employer or a self-employed person, there is an automatic payment of a charge calculated as a percentage of the amount of contributions due and rising progressively by 3 per cent for each month of delay. The maximum amount of charge is 27 per cent of the amount of contributions due.

Table A1.2 shows the legislated future contribution rate paid on behalf of an employed person.

▶ **Table A1.2. Legislated future contribution rate (as % of insurable earnings) for employed persons**

Period	Employee	Employer	State	Total
2019–2023	8.3	8.3	4.9	21.5
2024–2028	8.8	8.8	5.2	22.8
2029–2033	9.3	9.3	5.5	24.1
2034–2038	9.8	9.8	5.8	25.4
2039–2080	10.3	10.3	6.1	26.7

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A1.4.4. Financial provisions

The Social Insurance Fund maintains four separate accounts: the Unemployment Benefit Account, the Other Benefits Account, the Basic Pensions Account and the Supplementary Pensions Account.

The *Unemployment Benefit Account*, in principle, is credited with 1.15 per cent of the insurable earnings of employed persons on which contributions have been paid, and is charged with the payment of unemployment benefit.

The *Other Benefits Account,* in principle, is credited with 1.15 per cent of the insurable earnings of employed persons, 1.3 per cent of the insurable income of self-employed persons and 0.2 per cent of the insurable earnings of voluntary insured persons, on which contributions have been paid, and is charged with the payment of sickness benefit, maternity allowance, grants, employment injury benefits and administration expenses.

The *Basic Pensions Account,* in principle, is credited with 12.0 per cent of insurable earnings of employed and self-employed persons, 11.0 per cent of insurable earnings of voluntary insured persons, on which contributions have been paid, and is charged with the payment of pensions in the basic part of the GSIS, including old-age pension, invalidity pension, widow's pension and orphan's benefit.

The *Supplementary Pensions Account*, in principle, is credited with 7.2 per cent of insurable earnings of all insured persons, on which contributions have been paid, and is charged with the payment of pensions in the supplementary part of the GSIS, including old-age pension, invalidity pension, widow's pension and orphan's benefit.

A1.5. Non-contributory pension benefits

The non-contributory pension benefits provided under the GSIS are classified into two main categories:

(1) credited pension benefits; and

(2) pension supplements.

A1.5.1. Credited pension benefits

The credited pension benefits refer to the credits awarded to insured persons with respect to the following periods:

- *Service in the national guard:* Basic insurance credits to insured men for any period of service in the national guard of the Republic of Cyprus.

- *Unemployment:* Any period of unemployment for which unemployment benefit is paid (up to 26 weeks) and, in addition, any period of unemployment (up to 26 weeks) for which no entitlement to benefit exists.

- *Incapacity for work:* Any period of incapacity for work due to sickness, injury or maternity for which benefit is payable. For employed persons, a period of incapacity without benefit entitlement gives right to credits up to 26 weeks. For self-employed persons, such period gives right to credits if it is preceded by a period for which benefit was payable.

- *Parental leave:* Basic insurance credits to insured persons normally up to 18 weeks are granted to each parent entitled to pension, who claimed unpaid leave for child care after 1 January 2003, in respect of each child, for the period preceding the 8th birthday of the child, provided that the insured's parent does not have any paid or credited contributions in those weeks.

- *Childhood:* Basic insurance credits to insured women for childhood up to 156 weeks are granted to women entitled to pension after 31 December 1992, in respect of each child, for the period preceding the 12th birthday of the child, provided that she does not have any paid or credited contributions in those weeks.

- *Student:* Any period of full-time education or approved training after the age of 16.

- *Unemployment shortly after the Turkish invasion:* Credits awarded to insured persons for any periods of unemployment between 1.7.1974 and 3.10.1976, following the Turkish invasion. The level of credits is based on the level of paid or credited contributions in the years preceding 1.7.1974.

- *Prospective insurance period between the date of insured person's invalidation or death and age 63:* In case of invalidity or death of an insured person under the age of 63, the time between the date of invalidation or death and the age of 63 is deemed to be a period of insurance. The earnings to be credited for that period are based on the average insurable earnings in the supplementary part of the GSIS for the period most favourable between: (1) the last five years; (2) the period from October 1980 up to the relevant date; or (3) the period from the beginning of the year the person becomes 16 or 25 if this is after 6.10.1980 up to the relevant date. The condition for the award of prospective credits is that the person qualifies for the pension.

- *Retrospective insurance period with the introduction of the supplementary part of the GSIS:* Supplementary insurance credits awarded to insured persons aged between 50 and 63 as at 6.10.1980, the date of introduction of the supplementary part of the GSIS. Credits were granted from the age of 50 up to 5.10.1980, based on the level of paid or credited contributions in the supplementary part of the GSIS for the period from 6.10.1980 to the date the insured person becomes 63.

A1.5.2. Pension supplements

The pension supplements refer to amounts granted to pensioners for increasing their pension income. They consist of:

- *Minimum pension:* Refers to the amount of supplement necessary to raise the level of old-age, invalidity or widow's pension up to the minimum pension which is equal to 85 per cent of the full basic pension.

- *Invalidity pension:* Refers to the supplemental amount to the invalidity pension, in case of partial invalidity, granted at age 63 when invalidity pension is converted to old-age pension under the assumption of full invalidity (100 per cent).

A1.6. Benefits

A1.6.1. Benefit structure

The basic benefit is related to basic insurance. It includes increases for dependants. The supplementary benefit is related to supplementary insurance. No increases for dependants are payable on the supplementary benefit.

The basic insurance provides for the payment of a minimum pension equal to a percentage of the full basic pension in respect of old-age, invalidity and widow's pension. This percentage is set at 85 per cent. The minimum pension is €358.84 per month (paid for 13 months) in 2020 for a person with no dependants.

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The Consolidated Fund finances the amount between the 70 and 85 per cent. Every year, funds are transferred from the Consolidated Fund to the GSIS for the financing of the above amount. The funds transferred each year are determined as a fixed percentage of annual basic pension (old-age, invalidity and widow/widower) expenditure and that percentage is set by the appointed actuary of the GSIS every three years.

A1.6.2. Maternity grant

The insurance conditions are that the husband or the wife:

(1)   has been insured for at least 26 weeks and has basic insurance up to the date of birth of at least 0.5 of insurance point, earned from paid contributions; and

(2)   has paid or been credited with contributions which provided him/her with at least 0.39 of insurance point within the *relevant contributions year*.

The relevant contributions year is defined as the last contributions year, prior to the benefit year which includes the date of fulfilling the relevant insurance conditions. The benefit year is defined as the period which starts the first Monday of July of each year and ends the last Sunday prior to the first Monday of July of the following year. So for example, if the marriage incurred during the first half of 2020 the relevant contributions year is 2018, given that the benefits year runs from 1 July 2019 to 6 July, 2020.

The amount of the maternity grant is 6 per cent of the basic insurable earnings, i.e., €548,82 in 2020 and is paid only to the wife.

A1.6.3. Funeral grant

Persons eligible to the funeral grant are:

(1)   persons in receipt of old-age, invalidity, widow's pension, death benefit or missing person's allowance;

(2)   orphans receiving the orphan's benefit;

(3)   persons whose death is caused by work injury;

(4)   persons who satisfy the same insurance conditions as those of the maternity grant; and

(5)   dependants of persons specified in (1) and (4) above.

In 2020, the amount of the funeral grant, which is set at 5.6 per cent of the basic insurable earnings, is €512,23 for cases (1) to (4) above and €256.12 for dependants.

A1.6.4. Maternity allowance

The insurance conditions are that a person:

(1)   has been insured for at least 26 weeks and has basic insurance up to the first day of commencement of maternity leave of at least 0.5 of insurance point, earned from paid contributions; and

(2)   has paid or been credited with contributions which provided her with at least 0.39 of insurance point within the *relevant contributions year*.

The amount of the maternity allowance consists of the:

o basic benefit, which is equal to 72 per cent of the weekly value of the insurance point earned in the basic insurance during the relevant contribution year, increased to 80 per cent, 90 per cent and 100 per cent for one, two and three dependants respectively; and

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o supplementary benefit, which is equal to 72 per cent of the weekly value of the insurance points earned in the supplementary insurance during the relevant contribution year.

The benefit is not payable in the case of a woman who receives full wages during the maternity allowance period. If reduced wages are paid, the amount of such wages and the benefit payable cannot exceed full wages.

The allowance is payable for a period of 18 weeks beginning between the second and the ninth week preceding the expected week of confinement.

A1.6.5. Sickness benefit

Sickness benefit is payable between the ages of 16 and 63 to insured persons incapable of work. Persons who do not satisfy the insurance conditions for old-age pension at 63 are allowed to draw benefit up to the date on which they satisfy the relevant insurance conditions but in no case after the age of 65.

The insurance conditions are that a person:

(1)   has been insured for at least 26 weeks and has basic insurance up to the date of incapacity at least 0.5 of insurance point, earned from paid contributions; and

(2)   has paid or been credited with contributions which provided him/her with at least 0.39 of insurance point within the *relevant contributions year*.

The amount of sickness benefit consists of the:

o basic benefit, which is equal to 60 per cent of the weekly value of the insurance point earned in the basic insurance during the *relevant contribution year*, increased to 80 per cent, 90 per cent and 100 per cent for one, two and three dependants respectively; and

o supplementary benefit, which is equal to 50 per cent of the weekly value of the insurance points earned in the supplementary insurance during the *relevant contribution year*, up to a maximum amount of one times the basic insurable earnings.

To re-qualify for sickness benefit, the person must have paid contributions on earnings not lower than 26 times the weekly basic insurable earnings after the beginning of the period for which the right has been exhausted, and in addition a period of 13 weeks of employment must have elapsed since the date of exhaustion.

The benefit is not payable in the case the person receives full wages. If reduced wages are paid, the amount of such wages and the benefit payable cannot exceed full wages.

The waiting period before the commencement of the benefit is three days for employed persons and nine days for self-employed persons. The benefit is payable in each period of interruption of employment for 156 days and under certain conditions it can be extended for another 156 days.

A1.6.6. Unemployment benefit

Unemployment benefit is payable between the ages of 16 and 63. Persons who do not satisfy the insurance conditions for old-age pension at 63 are allowed to draw benefit up to the date on which they satisfy the relevant insurance conditions but in no case after the age of 65.

The insurance conditions are that a person:

(1)   has been insured for at least 26 weeks and has basic insurance up to the date of unemployment at least 0.5 of insurance point, earned from paid contributions; and

(2)   has paid or been credited with contributions which provided him/her with at least 0.39 of insurance point within the *relevant contributions year*.

The method of calculation of the unemployment benefit is the same as the sickness benefit. The waiting period before the commencement of the benefit is three days for employed persons and 30 days for voluntary contributors working abroad in the service of Cypriot employers. The benefit is payable for a maximum of 156 days.

To re-qualify for unemployment benefit, the person must have paid contributions on earnings not lower than 26 times the weekly basic insurable earnings after the beginning of the period for which the right has been exhausted, and in addition a period of 26 weeks of employment must have elapsed since the date of exhaustion. In case the person is at least 60 years old and does not receive any pension or lump-sum amount the period of 26 weeks is reduced to 13 weeks of employment.

A1.6.7. Invalidity pension

An invalidity pension is payable to a person who has been incapable of work for at least 156 days and who is expected to remain permanently incapable for work, i.e., unable to earn from work more than the $1/3$ of the sum usually earned by a healthy person of the same occupation or category and education in the same area.

The insurance conditions are that:

(1) the person has been insured for at least 156 weeks and has basic insurance up to the date of invalidity at least 3 insurance points, earned from paid contributions;

(2) the total number of insurance points in the basic insurance, earned from paid or credited contributions, is equal to at least 25 per cent of the number of years over the period between 5 October 1964 (or the first day of the year of attainment of age 16, if later) and the last day before the week of invalidation; and

(3) the person has paid or been credited with contributions which provided him/her with at least 0.39 of insurance point within the relevant contributions year. This condition is also satisfied if the average number of insurance points earned from paid or credited contributions over the last two years is equal to at least 0.39 of insurance point.

In the case of invalidity caused by any accident, insurance conditions are those of the sickness benefit.

The amount of the pension is equal to the old-age pension in case of full invalidity (100 per cent). When the loss of earnings is partial, the following percentages are payable:

Loss of earning capacity	Percentage of full pension
Below 66 2/3%	60
66 2/3% to 75%	75
76% to 99%	85

A1.6.8. Old-age pension

As a general rule, the old-age pension is payable at the age of 65 for men and women, provided that the following insurance conditions are met:

(1) the person has been insured for at least 780 weeks and has basic insurance up to the date of old-age pension entitlement at least 15 insurance points, earned from paid contributions; and

(2) the total number of insurance points in the basic insurance, earned from paid or credited contributions, is equal to at least 30 per cent of the number of years over the period between 5 October 1964 (or the first day of the year of attainment of age 16, if later) and the week before the week of old-age pension entitlement.

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Old-age pension could be paid at an earlier age on certain conditions:

- At age 63 if the insured person satisfies the above two insurance conditions and the total number of insurance points in the basic insurance, earned from paid or credited contributions, is equal to at least 70 per cent of the number of years over the period between 5 October 1964 (or the first day of the year of attainment of age 16, if later) and the week before the week of old-age pension entitlement.

- Miners are entitled to the old-age pension one month earlier than the pensionable age of 63 for every 5 months of work in a mine, but in no case before the age of 58, provided that they have at least three years of work in a mine.

An insured person in receipt of the invalidity pension immediately before reaching the age of 63 is eligible to the old-age pension. Also eligible to the old-age pension is the person between the ages of 63 and 65 who would be entitled to an invalidity pension if the person had not completed the age of 63. Eligibility to the old-age pension is not conditional on retirement from regular employment.

The old-age pension consists of:

- o the basic pension, which is equal to 60 per cent of the weekly value of the annual average number of insurance points earned in the basic insurance over the period between 5 October, 1964 (or the first day of the year of attainment of age 16, if later) and the week before the week of old-age pension entitlement, increased to 80 per cent, 90 per cent and 100 per cent for one, two and three dependants respectively; and

- o the supplementary pension, which is equal to 1.5 per cent of the weekly value of the total number of insurance points earned in the supplementary insurance.

For the purposes of old-age basic pension calculation, a maximum of six years of education/training credits is taken into account.

The old-age pension amount is subject to an actuarial reduction 0.5 per cent for every month included in the period between the date the person chooses to claim the pension (beyond the age of 63) and the age of 65 (up to a maximum 12 per cent actuarial reduction).

A lump-sum benefit is payable at age 68 to persons who do not meet the insurance conditions for an old-age pension, provided that the person has been insured for at least 312 weeks and has basic insurance up to the date of old-age lump-sum entitlement at least 6 insurance points, earned from paid contributions.

The lump-sum amount is equal to 15 per cent of the value of the total number of insurance points earned from paid and credited contributions.

A person may ask for postponement of the payment of the pension until the age of 68. In this case, the pension amount is increased by 0.5 per cent for each month of postponement. No deferment possible from age 63 up to the age of 65.

An old-age pensioner who has paid contributions on insurable earnings between the date of entitlement to the pension and the age of 65 is entitled to a weekly increase of the pension equal to 1/52 of 1.5 per cent of the total amount of insurable earnings during that period.

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A1.6.9. Widow's pension

The widow's pension is payable to the widow or widower of a person who, at the time of death:

- o had not reached the pensionable age and satisfied the insurance conditions (1) and (2) for the invalidity pension; or
- o was in receipt of old-age pension.

In the case of death caused by any accident, there is entitlement to the widow's pension provided that the insurance conditions for sickness benefit are satisfied.

The widow's pension consists of the:

- basic pension, which is equal to:
  - o if the spouse was not in receipt of an old-age pension, 100 per cent of the basic invalidity pension to which the deceased would have been entitled on his death; or
  - o if the spouse was in receipt of an old-age pension, 100 per cent of the basic old-age pension which was payable; and

- supplementary pension, which is equal to:
  - o if the spouse was not in receipt of an old-age pension, 60 per cent of the supplementary invalidity pension to which the deceased would have been entitled on his death; or
  - o if the spouse was in receipt of an old-age or invalidity pension, 60 per cent of the supplementary old-age or invalidity pension which was payable.

A lump sum is payable to a widow or widower whose spouse satisfies only the first insurance condition of the invalidity pension. This lump sum is equal to 15 per cent of the total number of insurance points earned from paid and credited contributions in the basic insurance plus 9 per cent of the total number of insurance points earned from paid and credited contributions in the supplementary insurance.

In case of remarriage, the widow or widower is entitled to a gratuity equal to one year's pension, excluding any increases for dependants.

A1.6.10. Orphan's benefit

The orphan's benefit is payable for a minor:

- (1) when both parents are dead and at least one of the parents was an insured person; or
- (2) when the parent who was taking care of the minor died in case where the parents were separated provided that the parent who died was an insured person; or
- (3) when one of the parents died and the surviving parent is not entitled to a widow's pension provided that the deceased parent fulfils the insurance conditions for a widow's pension; or
- (4) when the widowed mother/father, who was in receipt of widow's pension, remarried.

The amount of the benefit for cases (1) and (2) above consists of the:

- o basic benefit, which is equal to 40 per cent of the basic insurable earnings for each orphan; and
- o supplementary benefit, which is equal to 50 per cent of the supplementary widow's pension which was or would have been payable for each orphan (calculated for a maximum of two orphans).

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The amount of the benefit for cases (3) and (4) is equal to 20 per cent of the basic insurable earnings for each orphan and is payable for up to three orphans. The orphan's benefit is payable until the orphan attains age 15, or age 23 for a female in full-time education and 25 for male in full time education or in military service. There is no age limit for orphans who are unmarried and permanently incapable of self-support. A gratuity of one year's benefit is payable, for cases (1) and (2), on termination of his entitlement other than by death before the age of 17 (or a proportion of the year's benefit with respect to the months remaining up to the age of 17 if those are less than 12).

A1.6.11. Missing person's allowance

The amount of the allowance is the same as the basic widow's pension or the basic orphan's benefit, as the case may be.

A1.6.12. Employment injury benefits

Temporary incapacity (injury benefit) – The injury benefit is payable to an employed person incapable of work as a result of an employment accident or occupational disease. The benefit is payable for a maximum of 12 months from the date of accident. The amount of the benefit is the same as the sickness benefit, except that the basic benefit is the benefit which corresponds to the basic insurable earnings.

Disablement benefit – The disablement benefit is payable to an employed person who, as a result of a work injury, suffers a loss of physical or mental faculty of a degree of not less than 10 per cent, with the exception of disablement due to pneumoconiosis which is compensated from 1 per cent. Disablement benefit may take the form of either a grant or a pension depending on the degree of disablement.

The amount of the benefit is as follows:

- For an incapacity between 10 and 19 per cent, a disablement grant is paid, equal to €3,808 (in 2020) for 10 per cent disablement, increasing proportionately to €7,236 (in 2020) for 19 per cent disablement.

- For an incapacity of 20 per cent and above, a disablement pension is payable. For a 100 per cent disablement, the pension consists of the:

  (i) basic pension, which is equal to 60 per cent of the basic insurable earnings, increased to 80 per cent, 90 per cent and 100 per cent for one, two and three dependants respectively; and

  (ii) supplementary pension, which is equal to 60 per cent of the value of the annual average number of insurance points earned from paid or credited contributions in the supplementary insurance over the period beginning with the first day of the second year before the year in which the accident occurred and ending with the day of accident.

For a degree of disablement below 100 per cent, the pension is proportional to the actual degree of disablement. In addition, when the beneficiary of a disablement pension with a degree below 100 per cent is incapable of work and is expected to remain incapable permanently, and provided that the disablement is due to an employment injury, the disablement pension can be calculated on the basis that the degree of disablement is equal to the degree of invalidity, if this is more favourable to the beneficiary.

A constant attendance allowance of €232 per month (in 2020) is payable for disablement pensioners needing constant care.

- *Death benefits:* The death benefits are paid to the survivors of an employed person who dies as a result of employment accident or an occupational disease. The benefits include *widow's*

pension, *orphan's benefit* and *parent's allowance* when the deceased is not survived by a spouse or by orphans.

- The *widow's pension* consists of the:
  - o *basic pension:* same as basic disablement pension for 100 per cent disablement; and
  - o *supplementary pension:* 60 per cent of the supplementary disablement pension that the deceased was entitled to, for a 100 per cent disablement.

- The *orphan's benefit* consists of the:
  - o *basic benefit:* same as the orphan's benefit payable under cases (1) and (2); and
  - o *supplementary benefit:* same as the orphan's benefit payable under cases (1) and (2).

- The *parent's allowance* consists of the:
  - o *basic allowance:* 40 per cent of basic insurable earnings per parent; and
  - o *supplementary allowance:* 30 per cent of the supplementary disablement pension that the deceased was entitled to, for a 100 per cent disablement.

A1.7. General provisions

A1.7.1. Revision of insurable earnings

The amount of the basic insurable earnings as well as the ceiling on such earnings is adjusted in accordance the movement of the general level of insurable earnings every year. They are increased by the rate of increase of average insurable earnings between the two last years for which full statistical information is available. This means that the amount of the basic insurable earnings for 2021 is determined by applying the rate of increase of average insurable earnings between 2019 and 2020 to the amount of basic insurable earnings of 2020.

A1.7.2. Revision of benefit rates after award

The rates of basic pensions are reviewed at the beginning of each year in the same way as the basic insurable earnings are revised.

The rates of the supplementary pensions are reviewed in accordance with the increase in the cost of living. This revision is in line with the movement of the average level of the consumer price index over the two second half of the two years preceding the relevant year. This means that the annual rate of increase of the supplementary benefits as of 1 January 2021 is determined by a comparison of the average level of the consumer price index in the second half of 2020 and the second half of 2019.

Furthermore, the rates of pensions are increased every July in accordance with the increase in the cost of living of the first half of the year of reference compared to the second half of the previous year, if the increase is higher than 1 per cent. The July increase is taken into account when determining the increase of the rates of pension at the beginning of the following year.

A1.7.3. Beneficiaries under repealed scheme

Beneficiaries in respect of pension payable before the introduction of the new scheme on 6 October 1980 are receiving benefits corresponding to the basic benefits under the new scheme.

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A1.7.4. Social pension subsidy

The social pension subsidy represents the amount paid by the GSIS to the Consolidated Fund, thus contributing towards the financing of the tax-financed social pension scheme and is equal to the amount of increase of a GSIS pension that would have been granted to a GSIS pensioner if the dependant's spouse was not a recipient of social pension.

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▶ Annex 2. Methodology of the actuarial valuation

A2.1. Introduction

This actuarial valuation makes use of the comprehensive methodology developed by the ILO for reviewing the long-term actuarial and financial status of national pension schemes. These modelling tools include population, economic, labour force, wage and long-term benefits models. The long-term benefit model is based on the Excel/VBA version of the ILO pension model.

The actuarial valuation starts with a projection of the future demographic and economic environment of Cyprus. Next, projection factors specifically related to the GSIS are determined and used in combination with the demographic and economic frameworks.

A2.2. Modelling the demographic and economic developments

The use of the ILO actuarial 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 earnings levels in the basic and supplementary part of the GSIS.

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

A2.2.1. General population

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

A2.2.2. Economic growth

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

A2.2.3. 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. Aggregate employment is projected by dividing the real GDP (total output) by the average labour productivity (output per worker). Unemployment is then measured as the difference between the projected labour force and the total employment.

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

A2.2.4. Wages

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.

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However, due to the long-term perspective of the present study, the real wage increase is assumed equal to the increase in real labour productivity. It is expected that wages will adjust to efficiency levels over time. Wage growth is also influenced by an assumed gradual annual increase of the total labour income share of GDP over the projection period, which is concomitant with the assumed GDP growth.

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

A2.3. Modelling the financial development of the GSIS

The present actuarial valuation addresses all revenue and expenditure items of the GSIS. The most important components of this valuation concern long-term pension benefits. This section focuses on them.

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

A2.3.1. Purpose of pension projections

There are two main purposes of the pension model. First, it is used to assess the financial viability of the long-term benefits branch of the GSIS in the context of the triennial actuarial valuation as required by the Social Insurance Law. This refers to the measure of the long-term balance between revenue and expenditures of the GSIS. In case of imbalance, possible revisions of the contribution rate and/or the benefit structure are 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 GSIS, for the purpose of:

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

Furthermore, the pension model is also used for:

   o providing a solid quantitative framework to government authorities that can guide future policy decisions;
   o long-term budgetary planning; and
   o performing cash flow projections between the Consolidated Fund and the Social Insurance Fund.

A2.3.2. Pension data and assumptions

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

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

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GSIS-specific assumptions such as the disability incidence rates and the distribution of retirement by age are determined with reference to the GSIS legal provisions and the historical experience under the GSIS.

The projection of the annual investment income requires information on the existing assets on the valuation date. An interest rate assumption is formulated on the basis of the nature of the GSIS's assets, the past performance of the fund, the GSIS's investment policy and assumptions on future economic growth and wage development.

A2.3.3. 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 projections of insurable earnings and benefit expenditures are then performed according to the economic assumptions and the GSIS provisions.

Pensions are long-term benefits. Hence the financial obligations that a society accepts when adopting financing provisions and benefit provisions for them are also of a long-term nature: participation in a pension scheme extends over the whole adult life, either as contributor or beneficiary, i.e., up to 70 years for someone entering the scheme at the age of 16, retiring at the age of 65 and dying some 20 or so years later. During their working years, contributors gradually build entitlement to pensions that will be paid even after their death, to their survivors. It is not the objective of pension projections to forecast the exact development of revenue and expenditures of the GSIS, but to check its financial viability. This entails evaluating the GSIS with regard to the relative balance between future revenue and expenditures. This type of evaluation is crucial, especially in the case of the Cyprus GSIS, which has not yet reached its mature stage.

A2.4. Pension model

The actuarial pension model deployed for the purposes of this actuarial valuation is a standard deterministic cohort-based projection model performing long-term projections of income and expenditure for the GSIS. It is based on macrosimulation techniques, i.e., the projections rely on grouped data. Each status of an insured person (active person, inactive person and pensioner) is explicitly modelled, distinguishing new persons from initial stock.

On a regular basis, the actuarial pension projection model is subject to methodological enhancements in the context of continued improvement of the accuracy of the projection results. Following is an overview of the key methodological features that the current version of the model satisfies.

A2.4.1. Standard actuarial mathematics and transition probabilities

The pension projection model is based on standard actuarial mathematics for social security schemes. Key components of the mathematical structure of the model are the actuarially assumed transition probabilities (mortality rates, incapacity rates, retirement rates, etc.) which are used to map the transition status of an insured person (active, inactive or pensioner) in a given year onto the next year's status.

A2.4.2. Ensuring consistency between the active insured population and total employment

The pension projection model ensures that the development of the active insured population is consistent with the evolution of the employed population. This is achieved by applying annual

decrements (retirement, disability, mortality, exit, etc.) for each age and sex to the existing group of active insured persons and assuming a number of new entrants/re-entrants for each year, on the basis of the assumptions on overall employment growth and coverage rates considered by the pension model. For this purpose, an assumption on the distribution of new entrants/re-entrants by age and sex is used.

A2.4.3. Insured population groupings

The active insured population is disaggregated by age (single age), sex (males/females), insurance level (basic only/basic and supplementary), income group (by earnings band) and community.

For the purposes of projecting insured population by insurance level, the pension model captures the incidence of movement between "basic only" and "basic and supplementary" insured persons, reflecting GSIS past experience under which "basic only" insured persons at younger ages move to the "basic and supplementary" insured population grouping at early stages of their career.

With regard to the insured population grouping by community, the following three communities, which have distinct insurance profiles in terms of level of earnings and past insurance credits, are considered by the pension model:

  o "Cypriots" include Cypriot nationals;

  o "EU nationals" include EU and other third-country nationals who are entitled to a pro-rata pension from the GSIS even if they do not satisfy its normal eligibility conditions, because either: (i) under the EU regulation 883/2004, any insurance periods completed in other EU countries can be taken into consideration for the purposes of testing eligibility conditions, or (ii) certain social security bilateral agreements with Cyprus are in force; and

  o "TC nationals" include third-country nationals who qualify for a GSIS pension if they satisfy its normal eligibility conditions – not entitled to a pro-rata pension from GSIS because Cyprus has not entered into a social security bilateral agreement with the country of their nationality.

For the purposes of projecting insured population by community, the entry/leaving rates applied in the active insured population, as per the pension model, are linked to the immigration/emigration rates applied in the demographic population projections.

A2.4.4. Explicitly modelling inactive insured persons

The inactive insured population is disaggregated by age (by single age), sex (males/females), insurance level (basic only/basic and supplementary) and community.

The pension model incorporates the stock of inactive insured persons at the start of the projection period and explicitly models the new inactive insured persons, by capturing the incidence of movements between active and inactive insured persons.

A2.4.5. Explicitly modelling the accumulation of insurance points

In projecting the active and inactive insured populations, the following two key variables, which affect the accumulation of basic and supplementary insurance points of the insured persons, are explicitly modelled:

  o distribution of past insurance points (for both active and inactive insured persons) in base year; and

  o acquisition of new insurance points (for active insured persons) in subsequent years.

A2.4.6. Modelling the effect of the minimum pension

The pension model can estimate the projected cost of the minimum pension supplement with a high degree of accuracy since the distribution of pensioners by level of pension is produced by the model. The estimation of the distribution of pensioners by level of pension is possible through the insured population grouping by insurance level (basic only/basic and supplementary) and the modelling of the distribution of past insurance points and insurable earnings.

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▶ Annex 3. Financial results of the General Social Insurance Scheme, 2018–2020

This annex presents the financial results of the four accounts (Basic Pensions, Supplementary Pensions, Unemployment and Other Benefits) of the GSIS for the period 2018-2020 (see tables A3.1 to A3.4).

The reserve of the Basic Pensions Account has increased by 40 per cent, from €1,825 million at the end of 2017 to €2,548 million at the end of 2020. The reserve ratio of the Basic Pensions Account, i.e., the size of the reserve divided by the total annual expenditure of the Basic Pensions Account, has increased from 2.70 in 2018 to 3.27 in 2020.

The reserve of the Supplementary Pensions Account has decreased by 2 per cent, from €5,570 million on 31 December 2017 to €5,435 million on 31 December 2020. The reserve ratio of the Supplementary Pensions Account has decreased from 9.3 to 8.1 times the annual expenditure over the three-year period 2018-2020.

The annual level of expenditure on the Unemployment Benefits Account was lower than the income for the years 2018 and 2019. For the year 2020, in which additional benefits were given to unemployed persons in order to moderate the impact of COVID-19 pandemic, the expenditure on the Unemployment Benefits Account increased significantly, and exceeded 2020 income by around €20. Therefore, the overall financial status of the Unemployment Benefits Account slightly improved over the last three years and as a result, the reserve of the Unemployment Account has increased from €12 million at the end of 2017 to €13.5 million at the end of 2020.

The reserve of the Other Benefits Account has increased from €22 million at the end of 2017 to €70 million at the end of 2020. The above increase was achieved because the total amount of expenditure was significantly lower than the total amount of income for the years 2018–2020.

▶ Table A3.1. Basic Pensions Account

	2018	2019	2020
RESERVE at 1 January	**1 824 593 905**	**2 018 983 148**	**2 319 152 795**
Revenue			
Contributions	906 090 487	1 025 647 609	972 193 403
Receipt from Consolidated Fund	26 056 378	26 608 503	27 168 705
Interest earnings	2 783 567	2 876 183	3 367 885
Other income	5 909 414	6 196 677	5 082 486
Total income	**940 839 846**	**1 061 328 972**	**1 007 812 479**
Expenditure			
Benefits			
Pensions	746 449 554	761 157 802	778 513 661
Investment earnings paid	1 050	1 523	1 579
Total expenditure	**746 450 604**	**761 159 325**	**778 515 240**
RESERVE at 31 December	**2 018 983 148**	**2 319 152 795**	**2 548 450 034**

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▶ **Table A3.2. Supplementary Pensions Account**

	2018	2019	2020
RESERVE at 1 January	**5 570 318 763**	**5 515 017 372**	**5 508 752 088**
Revenue			
Contributions	527 728 592	615 434 213	583 354 904
Interest earnings	8 504 557	7 526 026	7 210 579
Other income	3 441 457	3 718 006	3 503 219
Total income	**539 674 606**	**626 678 245**	**594 068 702**
Expenditure			
Benefits			
Pensions	594 972 788	632 939 542	667 616 893
Investment earnings paid	3 208	3 987	4 131
Total expenditure	**594 975 996**	**632 943 529**	**667 621 024**
RESERVE at 31 December	**5 515 017 372**	**5 508 752 088**	**5 435 199 766**

▶ **Table A3.3. Unemployment Account**

	2018	2019	2020
RESERVE at 1 January	**12 118 405**	**24 218 423**	**34 304 241**
Revenue			
Contributions	87 870 172	93 194 884	88 836 968
Interest earnings	–	–	–
Other income	472 118	466 170	343 471
Total income	**88 342 290**	**93 661 054**	**89 180 439**
Expenditure			
Unemployment benefit	76 242 272	83 575 236	109 993 122
Investment earnings paid	–	–	–
Total expenditure	**76 242 272**	**83 575 236**	**109 993 122**
RESERVE at 31 December	**24 218 423**	**34 304 241**	**13 491 558**

▶ **Table A3.4. Other Benefits Account**

	2018	2019	2020
RESERVE at 1 January	**21 686 755**	**35 905 117**	**53 539 934**
Revenue			
Contributions	103 845 709	98 879 299	93 669 289
Interest earnings	55 368	73 146	92 267
Other income	3 506 421	3 648 623	2 905 413
Total income	**107 407 498**	**102 601 068**	**96 666 969**

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	2018	2019	2020
Expenditure			
Benefits			
Short-term benefits (including medical care)	77 072 204	69 105 551	65 166 653
Employment injury benefits	6 681 867	6 691 840	6 564 776
Investment earnings paid	21	39	40
Administrative expenses	9 435 044	9 168 821	8 925 782
Total expenditure	**93 189 136**	**84 966 251**	**80 657 251**
RESERVE at 31 December	**35 905 117**	**53 539 934**	**69 549 652**

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▶ Annex 4. Scheme-specific data and assumptions

A4.1. Introduction

In addition to the demographic and economic assumptions presented in Section 3 of this report, the projection of the future financial development of the GSIS requires a database specific to the GSIS (characteristics of insured persons and pensions in payment) and some particular actuarial assumptions. For the present valuation, projections have been performed separately for insured persons with basic insurance only and those with basic and supplementary insurance. In addition, basic data and assumptions have been divided according to the sex and age of insured persons.

A4.2. Data and assumptions on the insured population

A4.2.1. Number of insured persons

Data on the insured population were obtained from the Statistics and Information Systems department of the Social Insurance Services. The database presents a population of 493,713 active insured persons having contributed in 2020. Out of these persons, 305,457 had annual earnings over €9,566 (in 2020) and have thus been credited with both basic and supplementary insurance points. The distribution of these populations by age and sex is presented in table A4.1.

In addition to the persons who have contributed in 2020, the GSIS covers another 359,987 persons who have contributed to the GSIS in the past, but not in 2020. Their characteristics are presented in table A4.2. These persons still have the status of insured persons and may re-enter the GSIS at some point in the future.

▶ **Table A4.1. Active insured persons, 2020**

Age	Basic only			Basic and Supplementary		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**
15–19	3 086	2 861	5 947	154	127	281
20–24	13 681	11 978	25 659	5 591	4 004	9 595
25–29	15 230	13 800	29 030	18 396	15 490	33 886
30–34	12 088	13 466	25 554	25 071	19 369	44 440
35–39	10 000	12 760	22 760	26 870	20 986	47 856
40–44	8 251	11 941	20 192	24 274	19 803	44 077
45–49	6 467	11 104	17 571	20 514	16 991	37 505
50–54	6 071	9 925	15 996	19 254	14 912	34 166
55–59	5 663	7 031	12 694	17 815	12 111	29 926
60–64	5 071	4 725	9 796	13 599	8 575	22 174
65–68	1 799	1 258	3 057	1 029	522	1 551
Total	**87 407**	**100 849**	**188 256**	**172 567**	**132 890**	**305 457**

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▶ **Table A4.2. Inactive insured persons, 2020**

Age	Basic only[1]			Basic and Supplementary[2]		
	Males	Females	Total	Males	Females	Total
16–19	210	150	360	4	1	5
20–24	2 974	2 562	5 536	487	337	824
25–29	6 260	5 885	12 145	2 435	2 014	4 449
30–34	11 417	12 359	23 776	7 162	5 805	12 967
35–39	13 112	17 033	30 145	11 970	8 221	20 191
40–44	11 430	18 935	30 365	13 586	8 505	22 091
45–49	9 660	20 934	30 594	12 968	8 843	21 811
50–54	8 033	19 565	27 598	12 767	9 498	22 265
55–59	5 067	13 990	19 057	10 917	10 107	21 024
60–64	4 799	11 165	15 964	10 617	10 158	20 775
65+	4 012	7 005	11 017	3 585	3 443	7 028
Total	**76 974**	**129 583**	**206 557**	**86 498**	**66 932**	**153 430**

Notes: [1] Persons with at least one insurance point in the basic part of the GSIS are included. [2] Persons with at least one insurance point in the supplementary part of the GSIS are included.

A4.2.2. Insurable earnings

Credits under GSIS are computed in terms of points. For the year 2020, one insurance point is equivalent to annual earnings of €9,566. The first insurance point is credited to the basic part of the GSIS and annual earnings in excess of €9,566 and up to €54,860 are converted into insurance points in the supplementary part. Table A4.3 presents average annual insurable earnings of active contributors by insurance level (basic only/basic and supplementary) and for specific age groups.

▶ **Table A4.3. Average annual insurable earnings of active contributors** (2020)[1]

Age	Basic only		Basic and Supplementary	
	Males	Females	Males	Females
16–19	2 833	3 060	13 896	11 579
20–24	4 326	4 370	14 354	13 360
25–29	4 837	4 914	17 097	16 293
30–34	5 001	4 966	20 631	18 930
35–39	5 068	5 081	23 367	22 179
40–44	5 107	5 049	26 296	25 719
45–49	4 978	4 984	28 254	26 615
50–54	5 149	4 982	27 987	25 467
55–59	5 055	4 922	27 332	25 258
60–64	4 942	4 873	26 897	25 373
65–68	3 892	3 975	22 682	21 127
Total	**4 841**	**4 878**	**24 225**	**22 719**

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[1] New entries, re-entries and terminations are not included.

To reflect the dispersion of earnings and, consequently, the distribution of earnings for active contributors by insurance level (basic only/basic and supplementary), a coefficient of variation has been applied to average earnings by age group and for each year of projection. In addition, the average earnings of the insured population have been separated into three sub-groups: the lowest 30 per cent, a medium range of 40 per cent and the highest 30 per cent.

A4.2.3. Accrued insurance points

Accrued insurance points in the basic and the supplementary insurance of the GSIS, for the active and inactive insured populations, were obtained from the administrative file of the Statistics section of the Social Insurance Services. Average data by insurance level (basic only/basic and supplementary) are presented in tables A4.4 and A4.5 respectively.

► **Table A4.4. Past insurance points of active insured persons by insurance level in the basic and supplementary part of the GSIS, as at 31 December 2020**

Age	Insurance: Basic only		Insurance: Basic and Supplementary			
	Basic		Basic		Supplementary	
	Males	Females	Males	Females	Males	Females
23	2.6	2.5	3.3	2.9	2.3	1.7
28	4.0	4.8	5.6	6.5	3.9	4.0
33	5.9	6.5	9.2	10.3	8.2	8.2
38	8.1	8.5	13.5	15.0	15.9	17.0
43	10.2	9.8	17.8	19.1	27.3	27.1
48	13.0	11.6	22.3	23.0	37.6	33.9
53	17.8	14.5	26.4	25.9	44.3	36.2
58	23.9	18.2	31.9	29.6	53.5	41.6
63	33.5	23.6	38.6	33.4	63.0	49.1

► **Table A4.5. Past insurance points of inactive insured persons by insurance level in the basic and supplementary part of the GSIS, as at 31 December 2020**

Age	Insurance: Basic only		Insurance: Basic and Supplementary			
	Basic		Basic		Supplementary	
	Males	Females	Males	Females	Males	Females
23	1.2	1.4	1.8	2.2	0.8	0.4
28	1.5	1.7	2.6	3.4	1.3	0.9
33	1.5	1.8	3.5	4.3	2.0	1.7
38	1.4	2.0	4.0	5.4	2.9	2.9
43	1.5	2.1	4.6	6.1	4.0	3.8
48	1.4	2.0	5.3	7.4	4.8	4.7
53	1.4	2.3	7.3	8.6	6.8	5.4
58	1.6	2.5	11.5	11.7	15.5	9.0
63	1.8	2.7	11.9	12.8	15.5	11.3

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A4.3. Demographic assumptions related to the GSIS

A4.3.1. Mortality of insured persons

Mortality rates for the insured population have been assumed equal to the mortality rates of the general population. Sample mortality rates are presented in table A4.6. This mortality pattern is also used to project survivors' benefits payable on the death of insured persons or pensioners. Mortality rates are assumed to decline continuously during the projection period.

For invalidity pensioners, in the absence of statistics on the experience under the GSIS, mortality rates have been set to reflect the level of the Swiss EVK Table. Mortality rates for males and females were fixed, at age 20, at 25 times the mortality rate applicable to active insured persons and this ratio was linearly reduced to one at age 60.

► **Table A4.6. Sample mortality rates applied to the insured population**

Age	Males			Females		
	2021	**2050**	**2080**	**2021**	**2050**	**2080**
0	0.00488	0.00183	0.00059	0.00305	0.00105	0.00037
5	0.00012	0.00005	0.00001	0.00009	0.00004	0.00001
10	0.00010	0.00006	0.00002	0.00009	0.00005	0.00002
15	0.00018	0.00012	0.00007	0.00012	0.00008	0.00004
20	0.00035	0.00021	0.00012	0.00013	0.00009	0.00005
25	0.00045	0.00028	0.00020	0.00013	0.00009	0.00006
30	0.00048	0.00036	0.00028	0.00020	0.00014	0.00009
35	0.00066	0.00051	0.00041	0.00031	0.00022	0.00015
40	0.00096	0.00067	0.00053	0.00052	0.00036	0.00026
45	0.00154	0.00097	0.00073	0.00088	0.00052	0.00040
50	0.00244	0.00144	0.00100	0.00140	0.00081	0.00059
55	0.00390	0.00218	0.00138	0.00215	0.00130	0.00086
60	0.00675	0.00368	0.00218	0.00338	0.00197	0.00119
65	0.01062	0.00597	0.00356	0.00513	0.00291	0.00172
70	0.01773	0.01021	0.00609	0.00875	0.00477	0.00276
75	0.02943	0.01732	0.01047	0.01656	0.00886	0.00495
80	0.05360	0.03259	0.02038	0.03549	0.01937	0.01077
85	0.10315	0.06640	0.04513	0.08219	0.04762	0.02798
90	0.18956	0.13494	0.09963	0.17374	0.10868	0.06939
95	0.27477	0.22971	0.19078	0.27767	0.20211	0.14683
100	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

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A4.3.2. Invalidity incidence

Rates of entry into invalidity have been calculated from the past experience of the GSIS. Recent data for the years 2018, 2019 and 2020 were obtained. Invalidity incidence rates are kept constant for the whole projection period. The rates are presented in table A4.7.

▶ **Table A4.7. Rates of entry into invalidity**

Age	Males	Females
22	0.00008	0.00009
27	0.00017	0.00010
32	0.00019	0.00012
37	0.00038	0.00022
42	0.00048	0.00046
47	0.00089	0.00087
52	0.00163	0.00149
57	0.00316	0.00261
62	0.00585	0.00370

A4.3.3. Retirement

The actuarially assumed retirement rates used in the pension model are consistent with the economic framework described in Annex 2. Consistency checks are performed to produce an appropriate retirement pattern, which is consistent with the one observed recently under the GSIS.

Retirement rates are in principle applied from age 63 to 65 in the initial years as per recent retirement experience under the GSIS. These retirement rates gradually shift to higher ages, in line with the Social Insurance Law which provides for a periodic increase of the normal retirement age in the future.

A4.3.4. Family structure

Information on the family structure of insured persons is necessary for the projection of survivors' benefits. In the case of the GSIS, these data are also used to project the dependants' supplement paid in the basic part of the GSIS. Assumptions have to be established on the probability of being married at death, the age difference between spouses, the average number or children possibly eligible to an orphan's benefit and the average age of orphans.

Data on the percentage of persons married were obtained from tables of the 2011 Population Census. The age differential between spouses was calculated from data of the Demographic Reports of the Cyprus Statistical Services. The average number of children has been assumed equal to 0.1, considering the stringent eligibility conditions for this benefit and the observed number of orphans' benefits in payment. The average age of orphans has been set with regard to the age of the mother at first birth and with some margin for conservatism at older ages. These assumptions are presented in table A4.8.

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▶ **Table A4.8. Assumptions on the family structure** (for male insured persons)

Age	Probability of being married at death	Average age of the spouse	Average age of orphans
17	0.01	17	1
22	0.05	20	1
27	0.28	24	2
32	0.58	29	4
37	0.73	34	7
42	0.79	39	10
47	0.84	44	13
52	0.87	49	16
57	0.90	54	17
62	0.91	59	18
67	0.90	64	19
72	0.89	69	20
77	0.84	74	20
82	0.74	80	20
87	0.61	85	20

A4.4. Other assumptions

A4.4.1. Credited pension benefits

Considering the GSIS recent experience and trends over the period 2017–2020, as well as the development of the fertility rate, female labour force participation rates, education level and other factors, including legal requirements, assumptions were made with regard to the eligible credits to be awarded to future pensioners in respect of the following periods:

- o compulsory service in the national guard for male insured persons,
- o childhood – granted to female pensioners,
- o parental credits,
- o study,
- o unemployment, and
- o incapacity for work.

Section A1.5.1 of Annex 1 gives more details on the credited pension benefits.

A4.4.2. Indexing of GSIS parameters and pensions in payment

It has been assumed that the basic insurable earnings and the minimum pension are indexed annually in line with the wage growth assumption. In addition, pensions in payment are assumed to be indexed in the future in line with the wage index in the basic insurance and with the consumer price index in the supplementary insurance.

A4.4.3. Administrative expenses

Administrative expenses are totally affected to the Other Benefits account and are determined as the amount paid in 2020 indexed with the assumed nominal rate of increase of wages determined for the economic framework of the valuation.

A4.5. Pensions in payment, August 2020[2]

A4.5.1. Old-age pensions (amounts in € where applicable)

Age group	Basic only				Basic and Supplementary			
	Males		Females		Males		Females	
	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension
64	16	2 188	35	2 488	5 686	11 919	3 076	9 108
65–69	524	1 711	729	2 000	20 011	11 875	13 938	8 758
70–74	1 119	2 522	1 385	2 978	17 712	12 466	11 894	8 440
75–79	1 205	3 568	1 867	4 138	11 488	11 502	7 969	7 406
80–84	1 264	3 736	1 773	4 505	8 337	10 476	5 320	6 755
85–89	703	4 173	1 678	4 626	3 715	9 156	1 457	6 939
90–94	256	4 538	590	4 692	1 337	7 992	376	6 304
95+	51	4 498	99	4 620	247	7 397	70	6 099
Total	**5 138**	**3 328**	**8 156**	**3 969**	**68 533**	**11 559**	**44 100**	**8 125**

A4.5.2. Invalidity pensions (amounts in € where applicable)

Age group	Basic only				Basic and Supplementary			
	Males		Females		Males		Females	
	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension
20–24	–	–	–	–	–	–	–	–
25–29	4	4 722	–	–	15	5 235	1	4 601
30–34	2	5 047	2	3 513	44	7 341	19	6 020
35–39	3	3 206	2	4 082	103	7 317	39	5 927
40–44	5	4 621	2	4 645	171	7 940	103	7 041
45–49	5	3 977	3	4 713	261	8 246	176	6 698
50–54	8	4 660	10	3 177	483	8 257	273	6 441
55–59	12	3 880	16	3 499	816	8 647	484	5 927
60–63	13	2 753	30	3 010	820	8 678	438	6 253
Total	**52**	**3 870**	**65**	**3 333**	**2 713**	**8 413**	**1 533**	**6 275**

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[2] In the tables of this section, annual pensions are equal to 13 times the monthly pension.

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A4.5.3. Widows' pensions (amounts in € where applicable)

Age group	Basic only				Basic and Supplementary			
	Males		Females		Males		Females	
	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension
19–24	14	1 829	1	1 829	–	–	0	0
25–29	5	1 829	6	2 561	–	–	7	6 875
30–34	6	2 630	7	3 822	6	7 931	46	8 876
35–39	5	1 829	3	3 552	4	9 575	109	9 364
40–44	2	1 829	7	3 269	19	9 610	241	9 779
45–49	9	3 989	17	3 457	21	8 578	433	8 822
50–54	3	4 848	24	3 526	46	7 192	716	8 947
55–59	8	3 433	33	3 513	73	6 742	1 119	8 524
60–64	21	3 676	109	3 447	113	6 653	1 947	8 429
65–69	21	3 508	259	3 912	126	6 623	2 732	8 203
70–74	29	4 144	625	4 004	142	6 381	3 942	8 125
75–79	31	4 351	879	4 214	134	6 203	4 500	7 654
80–84	38	4 600	1 293	4 281	140	6 008	5 339	7 071
85–90	38	4 660	1 056	4 474	99	5 843	3 763	6 666
90–94	13	4 629	667	4 766	25	5 621	1 714	6 415
99+	2	4 665	279	4 989	3	4 665	302	6 285
Total	**245**	**3 953**	**5 265**	**4 323**	**951**	**6 487**	**26 910**	**7 604**

Note: For the purpose of actuarial projections, orphans aged 23 and over were classified as widowers.

A4.5.4. Orphans' pensions (amounts in € where applicable)

Age group	Basic only				Basic and Supplementary			
	Males		Females		Males		Females	
	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension
0–4	5	1 829	9	1 779	0	0	1	4 958
5–9	34	1 829	35	1 829	1	7 936	1	4 406
10–14	83	1 809	95	1 789	6	5 105	5	4 788
15–19	117	1 773	113	1 757	11	6 002	11	5 968
20–24	77	1 789	66	1 814	7	6 579	4	5 514
25–29	–	–	–	–	–	–	–	–
30–34	–	–	–	–	–	–	–	–
35–39	–	–	–	–	–	–	–	–
40–44	–	–	–	–	–	–	–	–
45–49	–	–	–	–	–	–	–	–

Age group	Basic only				Basic and Supplementary			
	Males		Females		Males		Females	
	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension	Number	Average annual pension
50–54	–	–	–	–	–	–	–	–
55–59	–	–	–	–	–	–	–	–
60–64	–	–	–	–	–	–	–	–
65–69	–	–	–	–	–	–	–	–
70+	–	–	–	–	–	–	–	–
Total	**316**	**1 793**	**318**	**1 787**	**25**	**6 026**	**22**	**5 500**

Note: For the purpose of actuarial projections, orphans aged 23 and over were classified as widowers.