THE EFFECTS OF POPULATION CHANGES ON THE PROVISION OF PUBLIC SERVICES IN BOSNIA AND HERZEGOVINA

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2022

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EXECUTIVE SUMMARY

A vital element of all social systems is the population, which is, therefore, often the object of decision-making or at least an integral part of it. During the second half of the 20th century, population in Bosnia and Herzegovina underwent a substantial transition from the traditional to the modern way of reproduction with a historical decrease in annual death rates. At the same time, the total fertility rate that was at the replacement level (about 2.1 live births per woman) in the late 1970s started decreasing and today, at 1.2, is considered the lowest low.

The past eight years (2013-2020) for which the detailed official statistics were mostly available have been marked by the decline in the total population size of Bosnia and Herzegovina. During this relatively short period, the population size of the country officially decreased by about 64,000 inhabitants (almost two per cent). However, this decrease was likely much more profound in reality. Estimates based on the mirror statistics suggest that the country lost additional 200,000 inhabitants through emigration in this period (or more than 7% of the total population). This translates into the loss of about 25,000 inhabitants on average annually in this period, and have caused the population age and sex structure to change, where the proportion of children decreased from 22.4% to 19.3% and the proportion of older persons increased from 14.0% to 17.2%.

From the perspective of past population data and population forecast and model projections, it could be concluded that the overall fertility in the country will continue to display low values belonging to the zone labelled in demography as lowest-low fertility. The mean age of mothers at birth is already relatively high and should stop or significantly slow down soon. Therefore, it is assumed that the decrease or even stagnation of the overall fertility will finish, and a very moderate long-term increase is expected.

Life expectancy growth at birth should remain significant but, at the same time, should slowly lose its dynamics. The volume of international migrations will very probably decrease due to the decline in population size and ageing, in particular because of less and less numerous younger cohorts – the core of potential migrants. The demographic impact of migration, which is currently more significant than the influence of natural change, at least in terms of the development of total population size, will undoubtedly wane. Sooner or later, the natural change balance should outnumber migration balance and become the leading component of the reproduction.

The forecast results indicate that the total number of inhabitants of Bosnia and Herzegovina will likely decline almost linearly in the next five decades. Assuming the population of the country amounted to 3.47 million persons at the end of the year 2020, then its total number should reach the mark of about 1.56 million within a realistic range defined by 1.27 and 1.81 million inhabitants by 2070. The reasons for such a dramatic drop are clear enough – low and decreasing natality due to a shrinking number of potential mothers and low fertility, a relatively high and increasing number of deaths caused by the growth of the number of older people, and negative net migration.

The expected change represents the total population's decline by about 55% by 2070. It is expected the number of young people to fall even more rapidly than the number of the total population itself. The relative pace of decrease should be very similar during the entire period. In absolute terms, the population will likely shrink by 33,000-45,000 persons annually during 2021-2070.

The decline in population size will be accompanied by continuing population ageing, primarily determined by the initial age structure of the population. It is expected that the mean age of the population will increase from its initial value of 42 years to unprecedented 54 years approximately, according to the medium variant, in 2070. The female population of Bosnia and Herzegovina should be, on average, about 56 years old and male population about four years younger.

As a result, it could be expected that there will be only about 680,000 inhabitants of productive-age in 2070 (or one-third of the initial value). The highest absolute decrease will likely occur in the 2030s, when Bosnia and Herzegovina should lose, mainly through migration and demographic ageing, about 350,000 persons of productive age. In addition, its working-age population will age significantly. The proportion of the population at productive age, which was relatively high (63.5%) at the end of 2020, should reach slightly less than 50% in 2050 and further develop to the unprecedently low value of about 43% in 2070. The number of children and adolescents until 19 years of completed age will likely drop from 669,000 in 2020 to about 350,000 after the first 30 years and approximately 230,000 at the end of the forecast period.

A slightly less than 600,000-strong contingent of older people in 2020 should grow above 820,000 persons at age 65+ within the following 30 years. After 2048, the number of older persons in Bosnia and Herzegovina is expected to decrease. Nevertheless, its share will likely grow continuously from 17.2% at the end of 2020 to almost 36% in 2050 and 42% in 2070. The share of the oldest-old (85 and over) among the overall older persons represented approximately 7% at the beginning of the forecast period in 2020. After 30 years, it should increase to about 17% and more than a quarter (26%) of the total population by 2070.

The increase in the number of older persons and decrease in the number of children and working-age population will cause a significant and continuous rise in entitlements to pension insurance, health care and social protection covered from the public budgets.

A constant net increase in the number of pensioners in Bosnia and Herzegovina was already recorded between 2014 and 2021. In 2014, the total number of pensioners in Bosnia and Herzegovina was 644,179. This number increased significantly during the period under review, so that at the end of 2021 it amounted to 702,130. This represents an increase in the number of pensioners in this period by 11.8 percent. Based on the increase in the number of pensioners, the annual expenditures for payment of pensions increased equally, from 2.66 billion BAM in 2014 to 3.6 billion BAM in 2021, which is an increase of 742.8 million BAM over the period of eight years, or 27.9 percent.

A projection of the trend in the number of pensioners for the period 2022 - 2031 shows that the number of pensioners will further increase from 711,431 in 2022 to 807,598 in 2031 in its medium variant (an increase of 96,167 pensioners). In the aggregate, during the period 2022-2031, the share of pensioners in the total number of population will likely increase by 2.52 percent, which will mean that their share will increase from about a fifth in 2022 to almost a quarter of all population in 2031.

At the same time, it is expected that the labour force in Bosnia and Herzegovina will decrease from 1,206 million in 2022 to 1,114 million in 2031 in its medium variant (a decrease of 92,025 people). Also, an increase in employment in Bosnia and Herzegovina is estimated at 83,667 over the next 10 years. This increase in employment is much smaller compared to the previous period, from 2017 to 2022, when an increase amounted to a similar percentage of growth but during a period almost twice as small.

Expenditures on pensions will be increasing significantly, but this will not be accompanied by a significant increase in the per capita amount of pensions due to a greater increase in the number of beneficiaries of an old-age pension, which will mean that the standard of living of pensioners will not be significantly improved. The projection of the trend in average real pensions showed that an average pension is expected to grow from 408 BAM in 2022 to 493 BAM in 2031 in medium variant, which represents a cumulative increase of 85 BAM on monthly basis or 20.8 percent over the next 10 years. With the transition of the pension system to treasury operations, the pressure on the method of financing pensions through contributions was reduced, but their importance is still enormous in the current and future periods.

The reduction of the working-age population and the growth of the 65+ population will contribute the most to this. On the other hand, the previous mild growth in population activation and labour force employment, as well as the low current growth rate of the economy of Bosnia and Herzegovina which was in the range from 0.87% (2010) to 3.74% (2018), will further worsen the pensioner standard. Assuming future economic growth in the country is continued at the same pace as it has been in the last decade, it is estimated that pension expenditure will increase from 10.01 to 10.93 percent of GDP.

In addition to the impact of demographic changes on the sustainability of the pension system in Bosnia and Herzegovina, another segment which will be affected by demographic changes is the health system, that is, the financing of the health system. Based on available statistical data, the share of public health expenditure increased from 1.54 billion BAM to 2.24 billion BAM from 2009 to 2019, which ultimately represents an increase in the share of public health expenditure in total public expenditures from 14.4 percent to 16.8 percent. Although public expenditures grew in the same period, public health expenditure grew at a higher rate, which led to a higher share of health expenditure in total expenditures.

An increase in the per capita public health expenditure was also observed ranging from 405 BAM in 2009 to 672 BAM in 2019, or an increase of 267 BAM (65.9 percent) mainly

due to a decrease in the number of inhabitants in Bosnia and Herzegovina over the given period. Based on forecast and model projections of population trends for the period 2022-2031, as well as trends in gross domestic product, the level of real public expenditure for health is estimated to further increase from 781.9 BAM in 2022 to 1,254.4 BAM in 2031, which is an increase of 472.5 BAM or 60.4 percent annually over the period of 10 years. The reasons for the increase in real public expenditure on health should be sought in the fact that in the period under review, 2022 - 2031, the total population in Bosnia and Herzegovina will significantly decrease, while the share of the population over 65, which represent the majority of beneficiaries of the healthcare system, will increase, and the ratio of labour force to the population over 65 will worsen.

At the same time, it is estimated that the share of public health expenditure in the total public expenditures will increase from 20.6 percent in 2022 to 24.2 percent in 2031, while the share of public health expenditure to the gross domestic product will increase from 7.6 percent to 8.6 percent, which is most credited to the higher total public expenditure on health, which according to model projections should increase from 2.65 to 3.78 billion BAM annually, according to the 2015 prices. Without further reforms, the health expenditures could increase by one percentage point of GDP and by 3.63 percentage points of total public expenditures between now and 2031. Declining population can reduce economic growth and—if not accompanied by a commensurate productivity growth—make it more difficult for Bosnia and Herzegovina to bear its health expenditures.

In terms of education sector in Bosnia and Herzegovina, between 2010 and 2021, the number of pupils in elementary schools decreased by 70,805 or 21.1 percent, in secondary schools by 43,353 or 28.6 percent, while the number of students decreased by 40,972 or 35.5 percent. Although the number of pupils and students is on the decrease, expenditure on education was growing for all three sectors of education with highest increase for elementary education (10.5 percent) and higher education (14.8 percent).

If expressed in per capita figures, expenditures per elementary school pupil increased from 2,348 BAM to 2,724 BAM or by 16 percent between 2016 and 2019, expenditures per secondary school student increased from 2,753 BAM to 3,216 BAM or by 16.8 percent, and expenditures per university student increased from 2,997 BAM to 4,242 BAM or by 41.5 percent. At the same time, expenditure per elementary school teacher increased from 28,029 BAM to 31,127 BAM or by 11.1 percent, expenditure per secondary school teacher increased from 27,332 BAM to 28,811 BAM or by 5.4 percent, and expenditure per higher education professor increased from 31,979 BAM to 34,652 BAM or by 8.4 percent. It is important to emphasize that according to the data of the Agency for Statistics of BiH for 2019, about 97.9 percent of expenditures on education refers to current costs, which mainly include the costs of salaries and allowances paid to teachers, while only 2.1 percent goes to capital expenditures.

It is expected that the number of pupils in elementary schools, between 2022 and 2031, will further decrease by 62,084 or 23.7 percent, those in secondary schools will decrease

by 20,231 or 18.7 percent and, similarly, those in higher education will decrease by 17,525 or 20.3 percent. If the ratio of pupils to teachers in elementary and secondary schools and higher education institutions from 2016 was applied to the model projections of the number of pupils and students until 2031, while retaining 10 percent of the teaching staff as a reserve, then in 2031 the number of teachers in elementary schools should decrease by 5,203 or 21.9 percent, the number of teachers in secondary schools should decrease by 2,019 or 17.1 percent, and the number of professors at higher education institutions should decrease by 1,302 or 18.1 percent, meaning that estimated 8,525 teachers and professors might become redundant.

Although the number of pupils and students will continue to fall, it is estimated that the total annual expenditure on education will continue to grow from 1.55 billion in 2019 to 1.93 billion in 2030, which represents an increase of 377.5 million BAM or 24.3 percent. In per capita terms, it is estimated that annual expenditures per elementary school pupil will increase from 2,840 BAM in 2020 to 4,499 BAM in 2030 or by 58,4 percent, expenditures per secondary school students from 3,351 BAM to 4,931 BAM or by 47.1 percent, and expenditures per university student from 4,293 BAM to 6,801 BAM or by 58.4 percent. The assessment was taken very conservatively, considering the unknowns regarding the changing numbers of teachers and professors in the future period. In line with past trends, it could be assumed that such increase will be based on the increased salaries of educational professionals rather than improved quality of education through the provision of modern teaching equipment.

Considering these findings and population forecast, it is evident that the most likely changes in the size and age-sex structure of the population of Bosnia and Herzegovina will have far-reaching consequences affecting virtually every aspect of society's life. The most affected by these changes will undoubtedly be the essential areas of public interest – public finance, social security and assistance, public health system, education, and labour market. Simultaneously, the productive age population representing the potential labour force will, beyond any doubt, rapidly decline and age during the entire forecast period. These changes will weaken the demand for jobs but also the labour potential of the population, thus raising public concerns over the future population development of Bosnia and Herzegovina.

Although the model projections show that the number of employees in Bosnia and Herzegovina will increase in the coming period, the level of the workforce will be decreasing, which will mean that the number of employees will be significantly closer to the number of the workforce. The availability of new workers on the labour market will largely depend on the way and possibility of activating the persons who are outside the labour force, primarily the female population, which accounts for almost two thirds of the total number of inactive persons. Future strategies largely need to take into consideration women's needs from the provision of childcare and care services for ever ageing population, to educational programmes that are aligned with other, non-paid responsibilities of women

such as taking care of households etc. If women are to be engaged in the labour market and contribute to socio-economic development, men will also need to engage more in household chores and take part of the burden of care for children, older persons and households. Furthermore, existing gender pay gap will have to be reduced as currently women are less paid than men for the same level of job and responsibility while the proportion of cost of institutional childcare remains high in women's income, hence keeping women out of the labour market.

It is of utmost importance to revise existing development policies and strategies at all levels in the country and incorporate population analysis and population measures in every aspect of human development. Furthermore, government authorities need to work on strengthening human capital in the country and respectively increase per capita productivity in all sectors of development. Human capital could be strengthened in numerous ways, from improving formal and non-formal education, to organising upskilling and reskilling for those already in employment, to developing policies that will enable adequate balance between work and personal time. Besides human development, it is necessary to invest greater financial resources in research and development and innovation (automation and robotics), with the aim of increasing the level of worker productivity, creating greater gross added value, and improving efficiency, speed, quality and performance.

Finally, reforms of the tax system should be introduced to decrease tax burden on employers and increase workers' salaries and wages. This would further stimulate the reduction of grey market, enable employment of unemployed and inactive persons, and increase government budgets that could be used for financing other public services from education to health care and to social protection with focus on those most vulnerable that cannot participate in the labour market.

Until the above measures start giving results, governments need to take into consideration development of immigration programmes to offset for changes in population size and structure. In order to provide sustainability to the labour market, it is necessary to learn from more developed countries and compensate for population losses by attracting skilled workers and their families from other countries and ensuring their long-term stay in Bosnia and Herzegovina (employment for adults and education for their children).

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ABBREVIATIONS

BAM/KM	Currency of Bosnia and Herzegovina
BHAS	Agency for Statistics of Bosnia and Herzegovina
BiH	Bosnia and Herzegovina
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
GDP	Gross Domestic Product
ILO	International Labour Organisation
IMF	International Monetary Fund
LFS	Labour Force Survey
NGO	Non-governmental Organisation
NHA	National Health Accounts
RS	Republika Srpska
SHA	System of Health Accounts
TFR	Total Fertility Rate
UNFPA	United Nations Population Fund
WWII	World War II

INTRODUCTION

A vital element of all social systems is the population, which is, therefore, often the object of decision-making or at least an integral part of it. Such an object can represent both individuals and groups of people, together with their relevant characteristics. Many of the qualitative features of specific individuals or groups of people are significantly related to their basic, demographic features: sex and age in case of an individual or size, sex, and age structure if they concern the whole population. It is consequently the development of the size and age-sex structure of the population that is the main object of demographic analyses and forecast.

Besides, human society is organised on a territorial principle, and therefore it is of high interest to analyse people living in a specific territory. The results of demographic analyses and, in particular, forecast and model projections then become one of the critical inputs for decision-making, especially within the development management at all administrative levels. At the same time, demographic forecast and model projections form the basis for prospective considerations of the development of many other, non-demographic characteristics of the population, as well as entire systems comprising people.

The objects of derived forecast and model projections may be various social or socio-demographic structures and their prospective developments. These include, for example, the number and structure of families and households; derived demographic estimates of the required capacity of public facilities or services; employment and labour market characteristics; revenue and expenditure of public budgets; parameters of technical infrastructure; consumer behaviour or choice of effective marketing strategies; volumes of commercial services or mass consumption goods necessary to meet the market or public demand etc. Hence, demographic changes in Bosnia and Herzegovina represent one of the most important short and long-term issues that will largely determine the way Bosnia and Herzegovina functions and its sustainability in the coming years.

In the economic sense, when looking at the production process, it is necessary to have an appropriate combination of production factors, namely the three most important - capital, labour and technology. Human capital is perhaps the most important resource, because it is through this factor of production that technology is used to turn resources into useful products with the help of capital. An important role in the use of human capital is represented by education, which should play an important role in increasing productivity and competitiveness of the economy.

However, in Bosnia and Herzegovina, the education system does not meet the needs of the labour market, which leads to the accumulation of a part of the workforce that is not in demand on the labour market, and on the other hand, there is a lack of professional workforce, a significant number of which leaves the country through emigration. Nevertheless, improvements in the educational process should lead to economic and other progress.

In recent years, Bosnia and Herzegovina has been losing the most important resource, which is human capital, as a direct consequence of demographic changes. Demographic changes mean a decrease in the number of citizens as a result of negative natural growth, emigration from the country, a decrease in the number of pupils and students, the ageing of the population and an increase in their number in relation to the total number of inhabitants.

Negative natural population growth was recorded for the first time in Bosnia and Herzegovina in 2008, after which the number of new-borns was decreasing every year, with a gradual increase in the number of deaths, which also affected the number of inhabitants. The consequences of demographic changes are reflected in the reduction of long-term economic potential, higher expenditures for the financing of pensions and the health system, and an increase in education expenditure per person.

A higher level of the long-term expenditure on pensions, if not accompanied by an increase in the number of workers who pay contributions and taxes, could threaten the sustainability of the pension and health system, unless the missing funds are collected from other tax sources, such as VAT and excise duties. That means less money for financing other public expenditures or reducing the state's investment potential. On the other hand, a large number of unemployed people, with an increase in life expectancy, means that there will be an increase in poverty and the need for benefits that requires additional resources, which will also affect the payment of existing pensions.

For this purpose, an analysis was made of model projections of public expenditures for pensions, education and health in accordance with demographic changes in Bosnia and Herzegovina for the period 2022 - 2031, which include forecast of population trends, the age structure of the population, the number of pensioners, expected expenditures for pensions with estimates of trends in average pensions, and expenditures for the health and education systems. These estimates, if regularly monitored and compared with the movements of the number of workers and the expected growth of the economy, will set alarm bells ringing during that period, if such a scenario occurs.

The analysis and its findings aspire to initiate and support an extensive discussion about the effects of population trends in Bosnia and Herzegovina on the provision

of public services, identify root causes and significant risks for socio-economic and population development of the country and identify effective measures to ensure the public services are organised and delivered with adequate quality and to all population groups, including those most vulnerable.

METHODOLOGICAL NOTES

Population or demographic development (dynamics) represents the process of change in the size and age-sex structure of the given population. It is a result of population reproduction, a permanent and continuous replacement of generations. Direct determinants of this change are the initial population size and age-sex structure, and partial processes (components) of the population reproduction components – fertility (natality), mortality, immigration, and emigration.

In the case of Bosnia and Herzegovina and its population, any descriptive, analytical, and consequently also prognostic efforts are faced with the issues of data availability and reliability. The problem is not so apparent in the registration of vital events (births and deaths) as in the case of migrations. Also, the disputed census conducted in 2013 represents a significant complication for developing more precise forecast. In the absence of the official migration statistics in the country, the so-called mirror statistics from other European countries were used, but they allow for only a partial analysis. At the same time, there is a lack of immigration statistics, resulting in incorrect population balances.

Elaborating representative population analysis and a full-fledged forecast for Bosnia and Herzegovina is very difficult without the use of analogies with structural and developmental regularities observed in other populations. Therefore, the country´s official statistics were combined with the official migration statistics of the main destination countries, published by the Eurostat and Federal Statistical Office of Germany, in addition to using relevant theoretical knowledge and some empirical findings obtained during analysing population development of the countries of the region and applied within forecasting of the country´s population development. Hence, the population forecast presented in this report can be interpreted as the most probable future development of Bosnia and Herzegovina's population size and age-sex structure given the lack of migrations data in the country.

The conditions mentioned above influenced the approach to problem-solving and the selection of applied methods. The forecast and model simulations are aligned with the internationally accepted methodological principles, while the cohort component approach and the corresponding projection method – a classic cohort-component method – and expert extrapolation of the observed trends have become the core of applied methodology. The cohort component projection method is based on the generation of new birth cohorts and their shift to higher ages under the simultaneous impact of the remaining components of population reproduction – fertility, mortality, immigration, and emigration.

The cohort component approach allowed consideration of the process

of demographic reproduction as a comprehensive process consisting of relatively autonomous partial reproduction processes and separate forecasting or modelling of their developments. The results of the analyses of these components and above mentioned theoretical and empirical knowledge of the authors applied through the principle of analogy led to the formulation of partial forecast and model assumptions. Then these assumptions were transformed into the parameters' values of the cohort-component projection model.

The final results were obtained by the repeated use of the projection model. The values of fertility, mortality and emigration intensities, as well as the numbers of immigrants by sex and age, were applied in a one-year projection step to the corresponding age-sex structure of the population within the projection model application. Thus, the numbers of living men and women divided into one-year age groups were gradually acquired at the end of each calendar year of the projection period. The simulations of the most probable and model population development within the territory of Bosnia and Herzegovina were performed using DeRaS and PoFoS software applications developed by experts in population forecasting and model projections at Charles University in Prague, the Czech Republic.

The uncertainty of the forecast is presented through three variants of future development: medium, high, and low. The medium variant represents the most likely trajectory of the expected development. The high and low variants then define realistic frameworks of future development for the uncertainty level of results given by the medium variant. These frameworks should not be further exceeded during the relevant period, and respectively their exceeding can occur only with a relatively low probability.

Attention to the formulation "initial age and sex structure" is essential. It is a neutral expression that does not judge these data's reliability due to the dispute over the census results and a lack of migration statistics. Due to this, it is only possible to envisage the overall population trends in the country. These trends are, however, so striking that, even using significantly different initial structures, one would hardly come to conclusions about the future population size and age-sex structure that are fundamentally different from those presented in this report.

The main limitation in the calculation of the forecast was related to the availability and reliability of individual statistical data. Certain time series were only available for a few years, which makes it very difficult to make a projection for a longer time period than the period of data availability.

For the purpose of collecting data for the development of model projections of public expenditures related to pensions, health care and education, the

official data of the Pension Insurance Institute of the Federation of Bosnia and Herzegovina and the Pension Insurance Institute of the Republika Srpska, which, according to the law, are responsible for collecting contributions for pension and disability insurance and paying pensions, were used.

In accordance with the aforementioned, these institutions have data related to the total number of beneficiaries of the right to pension, the structure of pensions according to the form of exercise of the rights, such as beneficiaries of old-age, disability and survivor pensions, and total monthly expenditures for financing pensions.

As for the prognostic model based on which the level of monthly pension expenditures was estimated, and based on the total number of pensioners in a given period, several linear regression models were created. To set up the prognostic model, monthly data were collected on the number of beneficiaries based on old-age, disability, and survivor pensions, as well as the value of total monthly expenditures for financing pensions. The afore-mentioned data were collected at the entity level, and then aggregated for the level of Bosnia and Herzegovina. The time series include 96 monthly values for the period January 2014 - December 2021.

The health information presented in this study is based on data available from the Agency of Statistics of Bosnia and Herzegovina, the Public Health Institute of the Republika Srpska and the Public Health Institute of the Federation of Bosnia and Herzegovina as of late June 2022. These data have been compiled primarily from publicly available databases and through communications secured by the UNFPA and were supplemented with data and analyses from peer-reviewed publications.

Calculation based on data from the aforementioned sources were used for building up macro models used for forecasting total health expenditure and include analysis of time-series and cross-sections of aggregate indicators.

National Health Accounts represent the health accounts of a country or region, prepared under the methodology of the System of Health Accounts. The SHA includes a series of very detailed and precise classifications of funding sources, providers and users in the health care systems, and their combinations in the tables and entries of the corresponding expenditures provide an overview of the structure of health spending.

Expenditures for health include all expenditures for activities whose primary role is to restore, improve and maintain health of the population, including mitigating the consequences of poor health through the application of appropriate health knowledge (medicine, care, traditional and alternative medicine).[1]

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[1] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2022/NHA_01_2020_Y1_1_BS.pdf*

In developing the prognostic model for education expenditures, the projected number of children and estimated number of pupils and students in Bosnia and Herzegovina for the period up to 2030, and available data from the Agency for Statistics of Bosnia and Herzegovina for the period from the school year 2010/2011 to 2021/2022 were used. Based on these data, model projections of the number of pupils and students were made by comparing data and the forecasted number of new-borns in Bosnia and Herzegovina for the specified period. The differences that appeared between the forecast of the number of new-borns and the number of pupils and students in a certain age group were resolved by estimating the percentage of the number of pupils and students in the total age group in the previous period, through available historical data.

When it comes to the data of the Agency for Statistics of Bosnia and Herzegovina, it should be noted that BHAS aggregates and publishes data obtained on the basis of statistical surveys on education conducted by the entity's statistical institutes and the Branch Office of the Agency for Statistics of BiH in Brčko District of BiH.

The Agency for Statistics of Bosnia and Herzegovina states that in education statistics, a school is considered to be a group of students organized into one school unit, with one or more teachers who conduct classes of a certain type, according to a certain curriculum, regardless of whether the school is central/home, independent, regional department or department at another type of school. Territorially separated units / regional departments within the elementary school, as well as departments for children with developmental difficulties in mainstream elementary schools are considered a school.[2] Children enrol elementary school at the age of six and elementary education lasts for nine years.

According to the definition, a secondary school is an institution for performing activities in the field of secondary education and upbringing. The school performs educational activities by implementing the curriculum. General and professional knowledge and abilities for further education are acquired at the school. A school can be established as a gymnasium, technical secondary school, vocational secondary school, religious secondary school, art secondary school, school for children with special needs and secondary school for adult education.[3] Secondary education lasts for either three of four years, depending on the curriculum, and enrols adolescents from 15 years of age.

Data for higher education are presented according to the Framework Law on Higher Education of Bosnia and Herzegovina. According to Article 65, the

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[2] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2022/EDU_03_2021_Y2_0_BS.pdf*
[3] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2022/EDU_04_2021_Y2_1_BS.pdf*

provisions of this law do not apply to theological faculties, higher theological schools and academies.[4]

Data related to expenditures on formal education in Bosnia and Herzegovina have been published since 2016, and were obtained through research into the financial statistics of education.[5]

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[4] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2022/EDU_05_2021_Y2_1_BS.pdf*

[5] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2018/EDU_06_2016_Y1_0_BS.pdf*

POPULATION FORECAST FOR BOSNIA AND HERZEGOVINA

During the second half of the 20th century, population reproduction in Bosnia and Herzegovina underwent a substantial part of its transition from the traditional (extensive) to the modern (intensive) way of reproduction. A historical decrease in annual death rates below the level of 10 deaths per 1,000 inhabitants was completed during the 1950s. Meanwhile, the analogous reduction of birth and fertility rates continued until the beginning of the 2000s, when births per 1,000 inhabitants were below ten births annually. Meanwhile, the total fertility rate reached the replacement level (about 2.1 live births per woman during her entire reproductive period) in the late 1970s. Since then, a completed demographic transition (demographic revolution) and the domination of the modern forms of population reproduction have been observed in the country.

The past eight years (2013-2020) for which the detailed official statistics were mostly available have been marked by the decline in the total population size of Bosnia and Herzegovina. During this relatively short period, the population size of the country officially decreased by about 64,000 inhabitants, i.e., nearly by two per cent (Fig. 1). However, this decrease was likely much more profound in reality. Estimates based on the mirror statistics of migration with most of the EU and EFTA countries suggest that the country lost up to 200,000 inhabitants between 2013-2020. This number would represent more than 7% of the total population at the end of 2012.

Figure 1: Total population and its dynamics, 2012 – 2020 (population as of Dec. 31)
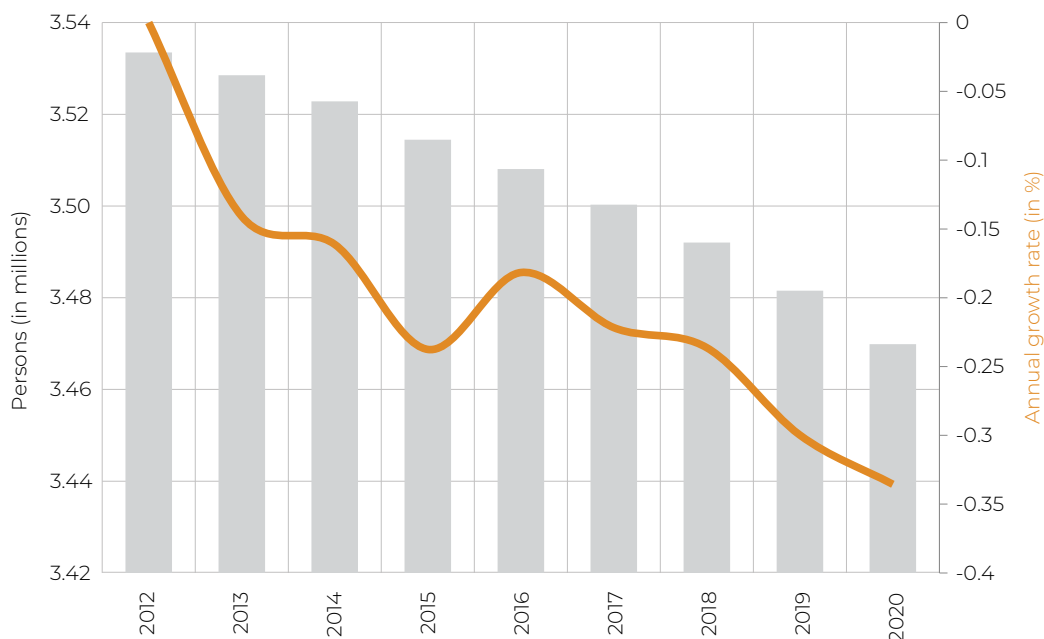
Source: Created by authors based on data from the BiH Agency for Statistics

These eight years of development have meant rapid population decrease and fundamental changes in population age structure. The most numerous generations (birth cohorts) formed between the second half of the 1950s and the end of the 1990s got older and recently started to leave the productive age interval (15-64 years). It means that more numerous generations are replaced by substantially less (by more than one-third) numerous ones born in the first half of the 2000s, mostly moving across the threshold of retirement age during the same period (Fig. 2). Current age-sex structure is more regular than that of ten years ago, since the irregularities caused by low natality during WWII and its marked increase in the aftermath of WWII have been further smoothed by the effects of mortality and partially also migratory movements.

Another characteristic and, at the same time, a specific feature of the recent population development of Bosnia and Herzegovina is changing sex structure of the population. The process of population ageing, together with natural mortality differentials between sexes, has resulted in a moderate increase in the proportion of women, from 50.9% at the end of 2012 to nearly 51.0% in 2020. Fig. 3 shows the resulting ratio of males and females by age at the end of 2020 – natural dominance of males until about 50 years of age and females in the second half of the observed life span.

Figure 2: Population age-sex structure, 2012 and 2020 (as of Dec. 31.)
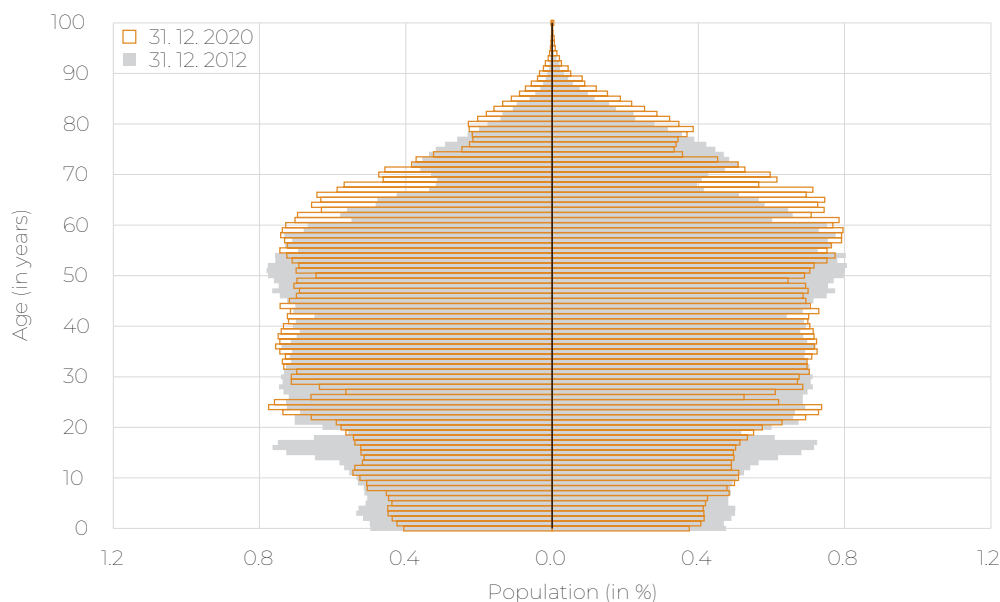
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 3: Proportion of women by age, 2020 (as of Dec. 31)
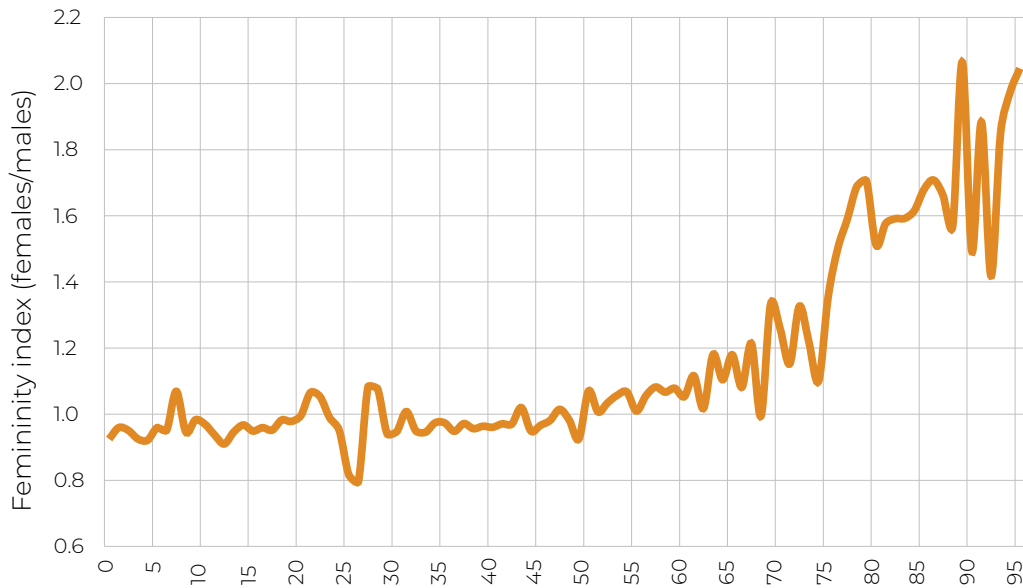
Source: Created by authors based on data from the BiH Agency for Statistics

The observed eight years of the population age-sex structure development were marked by dynamic population ageing. The mean age of the population grew steadily (Fig. 4) throughout the period under review. Between the end of 2012 and 2020, the mean age of the country´s relatively young population grew by 2.2 years and reached 42.0 years at the end of 2020. The difference in mean age between male and female parts of the population is relatively stable and represents about 2.5 years. It is another manifestation of the ageing population structure, the mortality differentials, and a higher proportion of males in younger birth cohorts.

Another tangible manifestation of population ageing faced by Bosnia and Herzegovina is the observed change in the share of the main population categories (Fig. 5). The proportion of children decreased by more than three percentage points, from 22.4% to 19.3%. The proportion of older persons increased by more than three percentage points, from 14.0% to 17.2%. Consequently, the population of productive age (15-64 years) increased its representation in the country's population by about seven percentage points, from 63.1% to 70.7%. The so-called demographic window of opportunity, where there is more working age population than dependants, is now fully open in Bosnia and Herzegovina. However, it has already started to close since the highest percentage of the latter category (about 64%) was reached around the middle of the previous decade. Up to now, the closing is slow but will accelerate soon.

Figure 4: Mean age of population by sex, 2012–2020, (as of Dec. 31)
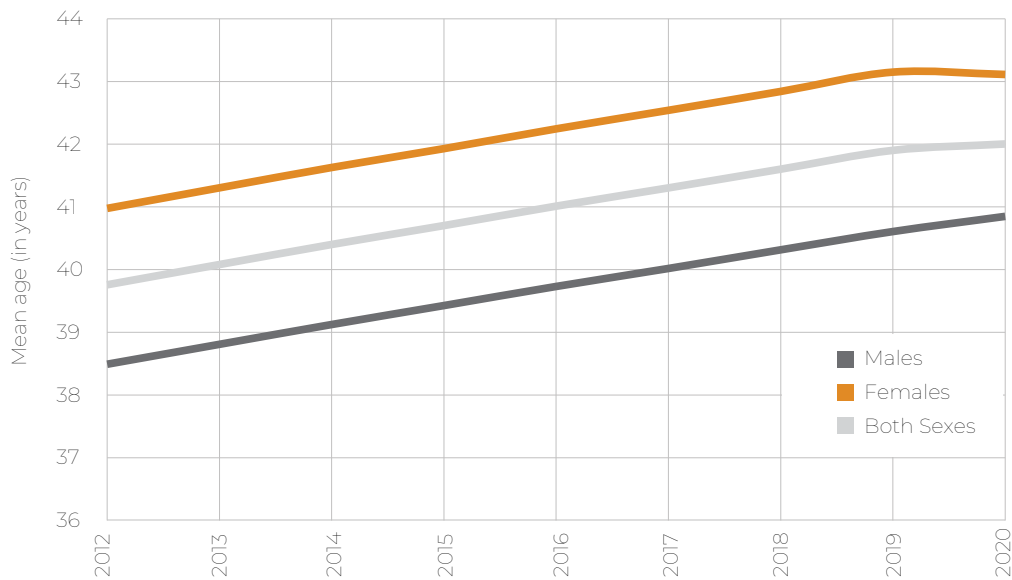
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 5: Population by main population categories, 2012-2020, selected years (as of Dec. 31)
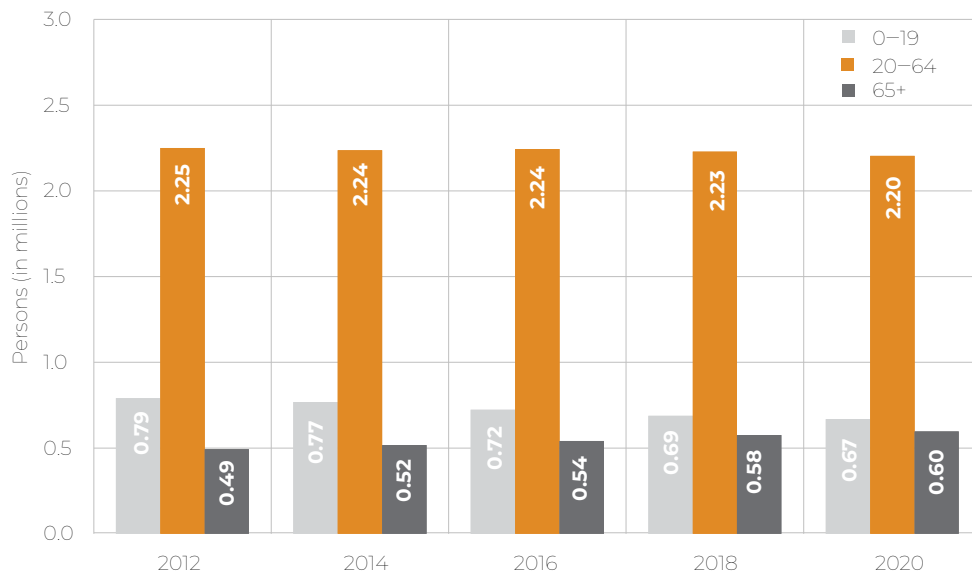
Source: Created by authors based on data from the BiH Agency for Statistics

The deeper the age structures of the population were analysed, the more significant changes were observed over time. Subsequently, decreasing birth rates during the past decades and especially after the year 2000 resulted in oscillations of the size or simple decreases of the birth cohorts of children and young people (0-23 years of age) in the order of units and tens of per cents during the period of observation (Fig. 6). In this respect, the changes at the other end of

the age structure were significantly more stable. However, there were also minor oscillations, namely in two eldest age categories (75+ and 85+). The fluctuations observed in 2012-2020 (Fig. 7) were related to the entry of the generations affected indirectly by WWII, i.e., the generations formed during those years. In sum, the number of people aged 85 and over grew by three quarters within only eight years of observation, while the size of the other two open age groups, 65+ and 75+ years, increased "only" by about 20% and 15%, respectively.

Figure 6: Change in the number of children and young people by selected age groups, 2012–2020 (as of Dec. 31)
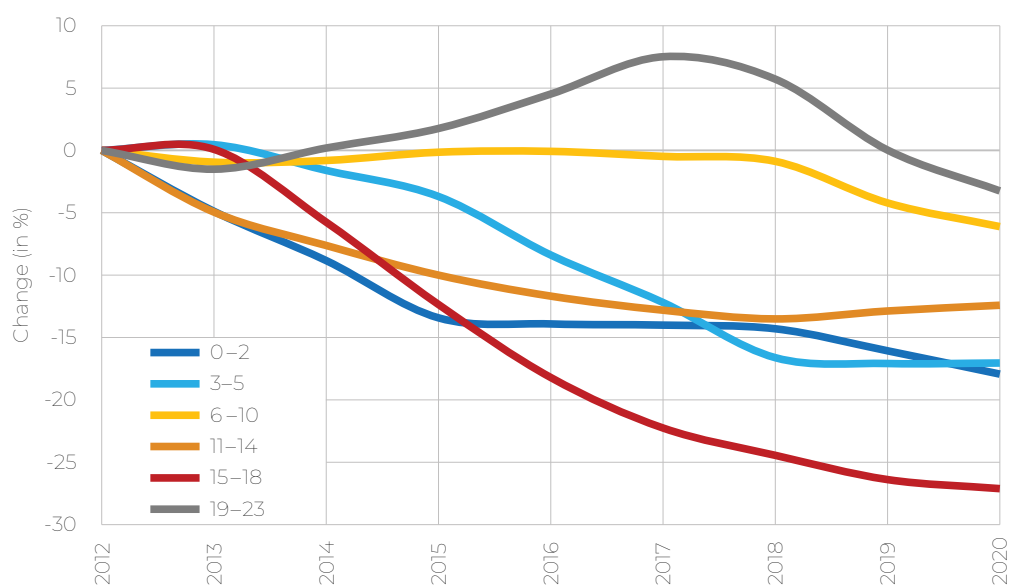
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 7: Change in the number of the elderly by selected age groups, 2012–2020 (as of Dec. 31)
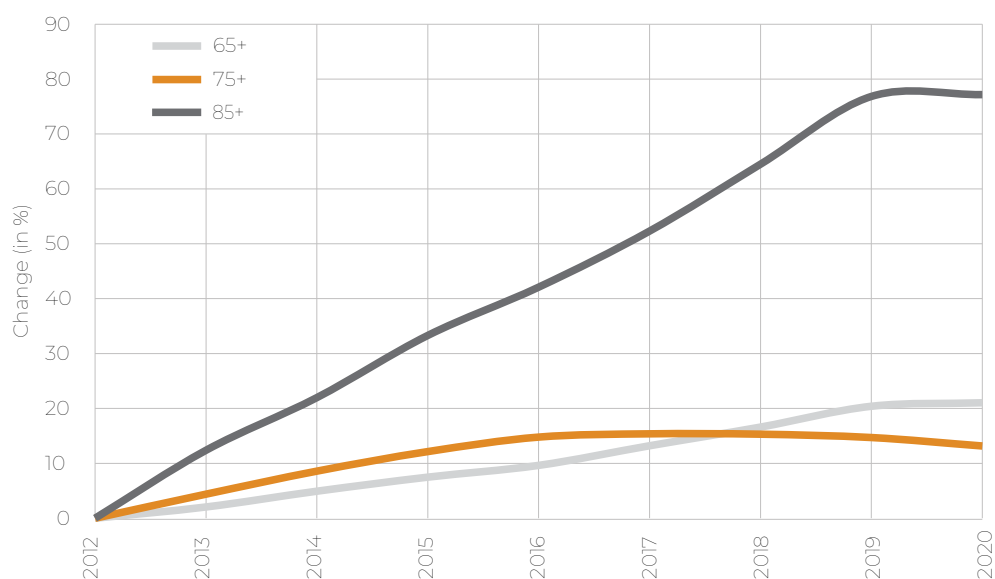
Source: Created by authors based on data from the BiH Agency for Statistics

The ageing dynamics of Bosnia and Herzegovina's population are considerably high, even though one is not too far from the beginning of this unavoidable long-term process. The observed changes are entirely in line with the theory of demographic transition. It figuratively represents a tax on the modernization of the reproductive behaviour of the country's population in the relatively recent past, in the post-WWII period.

The relatively younger age structure of the population, especially with quite a high number of potential mothers, was insufficient for a significant reduction of the balance losses in Bosnia and Herzegovina during 2013-2020. These deficits originate in both aggregate population development components - natural change and migration (Fig. 8). The number of births was significantly lower than the number of deaths and the difference between them has been growing during almost the entire period (Fig. 9). This was primarily a consequence of low fertility.

Figure 8: Total change balance, 2013–2020
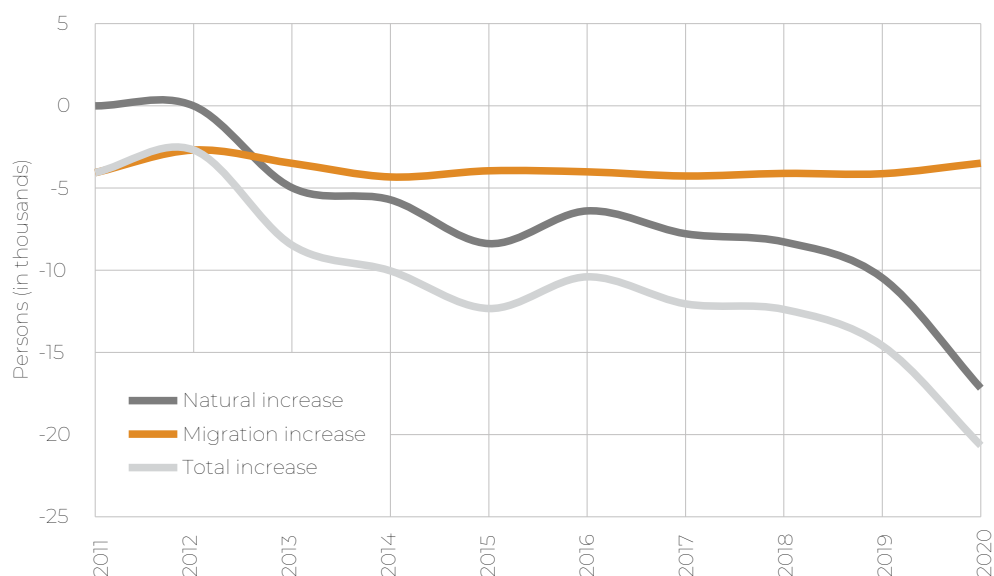
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 9: Natural change balance, 2013–2020
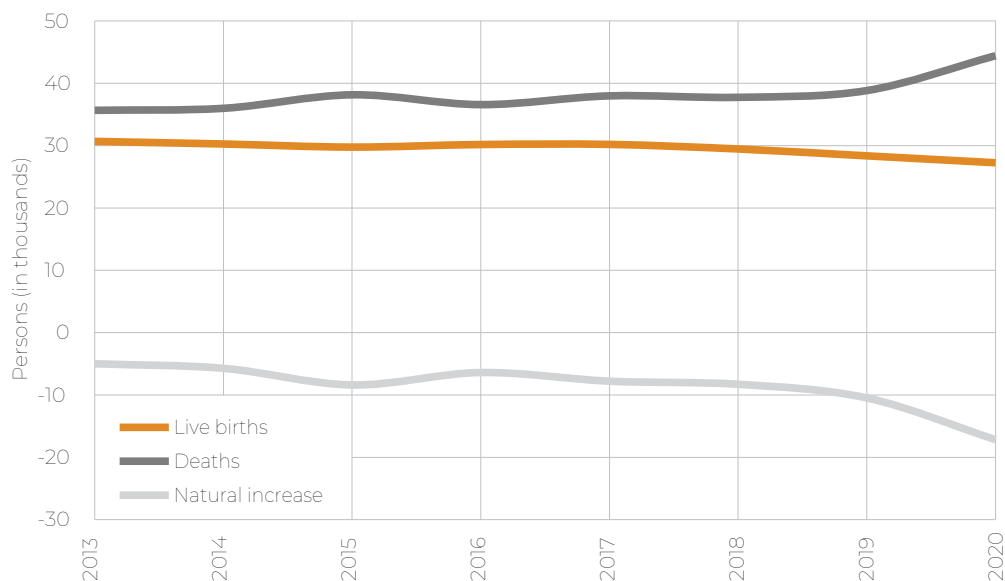
Source:Created by authors based on data from the BiH Agency for Statistics

The level of overall fertility was very low already in 2013. The observed values of total fertility rate stayed deeply below the replacement level (represented roughly by 2.1 live births per woman) in zone one of the "lowest-low fertility". These values were unstable over the entire period of observation (Fig. 10). The insignificant fluctuations of the TFR were accompanied by a significant increase in the mean age of mother at childbearing (Fig. 11). Observed postponement of childbearing until an older age also affected the decline in the overall fertility.

The distribution of fertility by single-year age groups of mothers increased its symmetricity with modal age (the age of the highest intensity of reproduction) at 29.5 years in 2013 and 2020 (Fig. 12). The resulting frequency curve is practically symmetric since the mean and modal ages (mean age of mother at birth of a child and the period when half of the overall fertility is completed, respectively) showed almost the same values as the modus did in 2020 (Fig. 13). The comparison of the levels of fertility in standard five-year age groups in the single years of the period 2013-2020 clearly shows a gradual decline in the first three age groups, ambiguous fertility development in the group 30-34 years, univocal increase in fertility at age 35-39 and the similar trend among females at the age 40 and more years.

Figure 10: Total fertility rate, 2013–2020
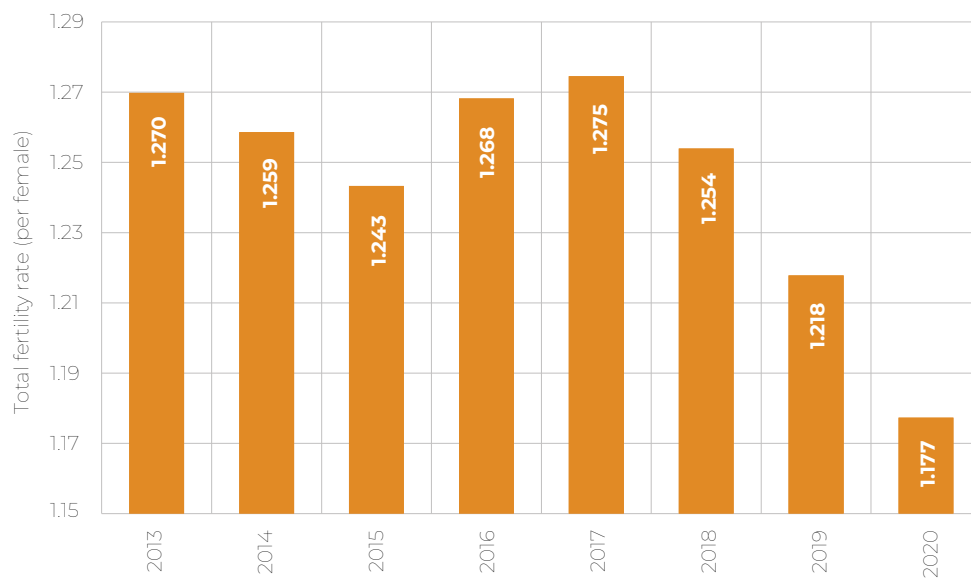
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 11: Mean age of mother at childbearing, 2013–2020
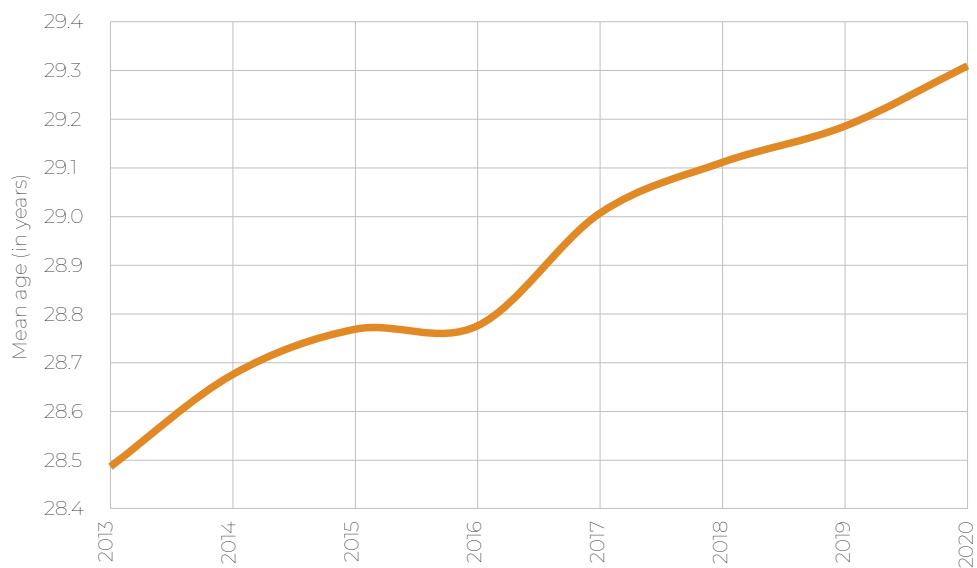
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 12: Fertility distribution by age, 2013–2020, periods, one-year age groups
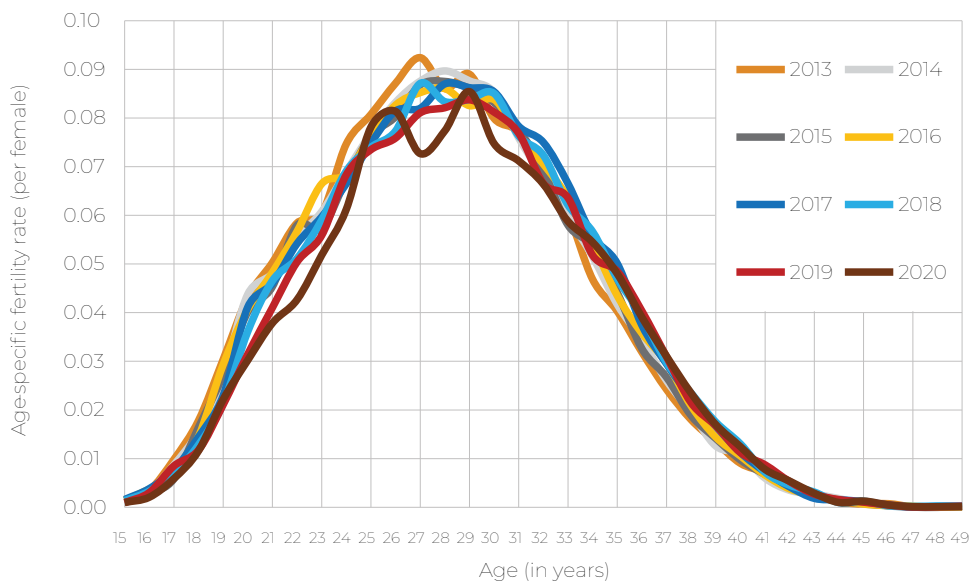
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 13: Fertility distribution by age, 2013–2020, 5-year age groups
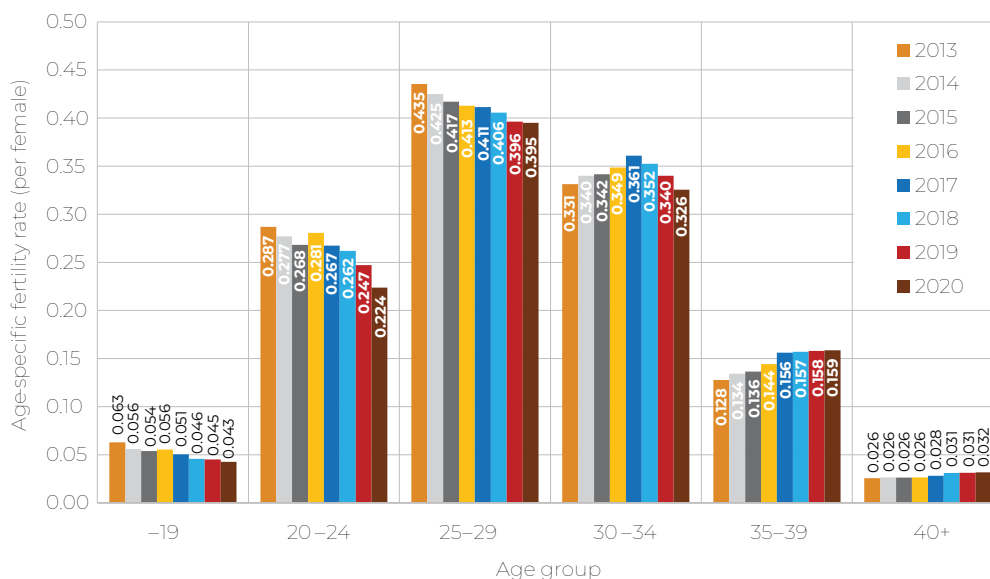
Source: Created by authors based on data from the BiH Agency for Statistics

The observed changes in the age distribution of fertility in Bosnia and Herzegovina are in correspondence with the changes experienced by many other countries, namely the European ones, earlier and mostly also at higher levels of overall fertility. This could be understood as a manifestation of modernity, but also other less favourable factors, like the country's economic, social and political instability,

probably have a role. Historically, lacking faith in the future frequently resulted in a decrease in the overall fertility and postponement of parenthood to more favourable times, i.e. higher ages.

More pronounced developmental tendencies than in fertility are inherent to mortality, the second component of natural change. Over the observed eight-year period, average life expectancy first increased in the case of men from 73.7 to 74.8 (2018) years, and in the case of women from 78.6 to 79.2 (2019) years, but then the mortality impact of the COVID-19 pandemic put the empirical values of life expectancy at birth for both sexes below their values for 2013. The men´s mortality downturn caused by COVID-19 was more pronounced than for women. Compared to the highest value achieved, their life expectancy dropped by 1.6 years, while for women, it decreased by 0.8 years, reaching 73.2 and 78.4 years, respectively (Fig. 14).

Besides the growth of life expectancy at birth, a moderate decline in male excess mortality (difference in life expectancy between females and males) was observed. This gap has narrowed from almost five years in 2013 to less than four and a half years in 2019. This is another positive feature of the past mortality developments in Bosnia and Herzegovina (Fig. 15). The observed trend was quite clear with small random fluctuations of the values before COVID-19. The consequent more profound male mortality increase contributed to the growth of the difference between sexes, representing 4.7 years in 2019.

Figure 14: Life expectancy at birth by sex, 2013–2020
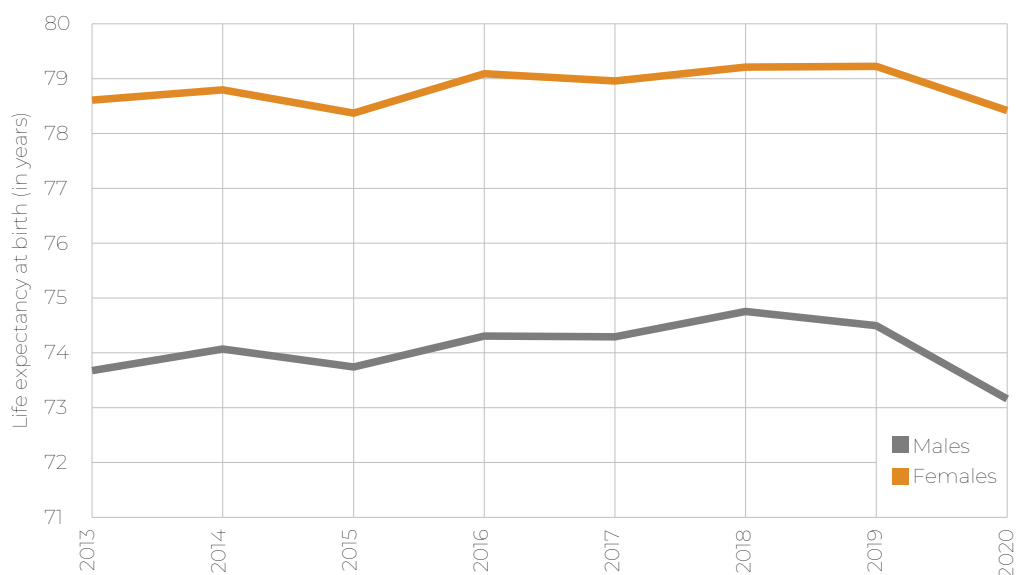
Source: Created by authors based on data from the BiH Agency for Statistics

Figure 15: Difference between female and male life expectancy at birth, 2013–2020
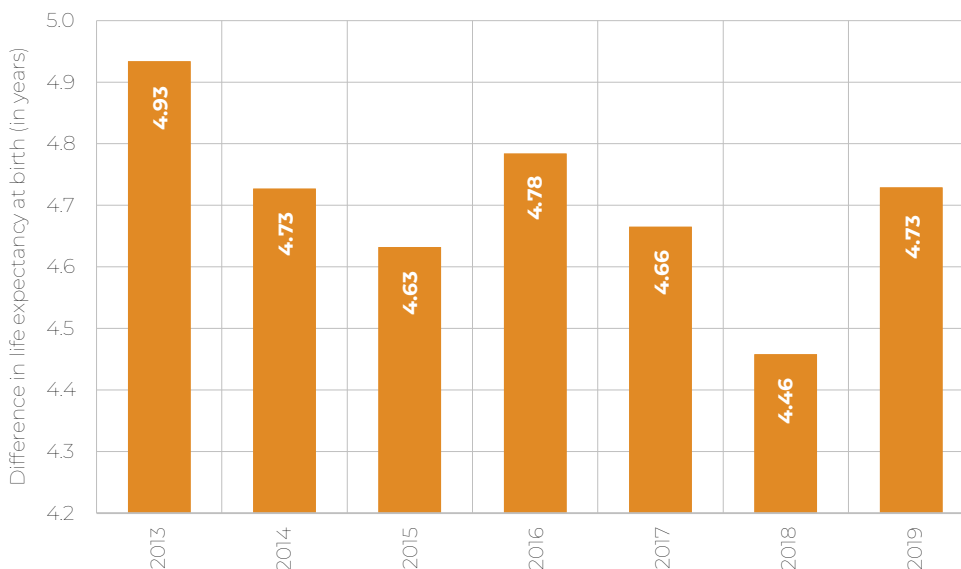
Source: Created by authors based on data from the BiH Agency for Statistics

Regardless of the significant increase of life expectancy at birth, i.e., the decrease of overall intensity of mortality, the number of registered deaths grew by almost 9% between 2013 and 2019. Thus, the actual increase in deaths is due to the ageing population, especially in the growth of older persons. As already presented, about 493,000 inhabitants aged 65 and over lived in Bosnia and Herzegovina at the beginning of 2013. In 2020, there were already about 597,000 older inhabitants. This fact explains the opposite development of mortality intensity and the number of deaths. In 2020, COVID-19 caused, both directly and indirectly, about 5,000 extra deaths. Irrespectively, those deaths represent approximately 12 per cent of excess deaths. Such mortality increase should be perceived as a sudden large-scale fluctuation, likely subject to future compensation.

Migration is currently the most significant component of Bosnia and Herzegovina's population development, although not based on the official country statistics. This insight results from foreign, so-called mirror statistics of the countries where migrants from Bosnia and Herzegovina most often go. Based on mirror statistics, it could be estimated that the net migration (difference between the numbers of immigrants and emigrants) represented the loss of about 25,000 inhabitants on average annually. The impact of migration is not only about inhabitants´ moving to foreign countries but also about the indirect effect of migration on natural reproduction, namely on the birth rate. Its scale is, however, very difficult to estimate.

In 2020, the general conditions for forecasting population development changed fundamentally. This situation arose from the COVID-19 pandemic's

unpredictable development mirrored already in some population data for 2020. However, the reflection of the pandemic in this data was only partial because there was not enough time for its full manifestation in all the components of population reproduction.

The official country population statistics and international migration statistics indicated several significant changes. First, the level and age-sex structure of mortality substantially changed in 2020. Secondly, the unprecedented restrictions on the international movement of people, introduced due to the epidemic, principally affected migration flows across the state borders. Only fertility in 2020 continued in its decline that began already in 2018, and no extraordinary changes were observed since the consequences of the pandemic did not have enough time to get manifested.

When estimating future developments of fertility and mortality parameters, it is necessary to follow recent trends identified within the detailed analysis of the data provided by official country population statistics. The reference sources for immigration and emigration were, as it was already mentioned, international statistics completed by official statistics of some countries and not covered by international ones. Obtained empirical information was compared with theoretical knowledge and real developments in the countries where demographic transition also began after World War II. Specific findings were drawn from the development of individual reproduction processes in the countries with a similar history and a comparable degree of social and economic development. Formulated assumptions were consequently modified by intuitive assessment of further developments related to the pandemic and security situations in Europe and their wider consequences.

As a result, it was concluded that the overall fertility level in Bosnia and Herzegovina will return to slightly higher levels. Slowing down or stopping the increase of the mean age of the mother at the birth of a child should contribute to this change. In 2022 and the following years, an increase in the total fertility rate is expected, partially caused by the current compensation for decrease. This compensation should be completed by the end of 2024. Afterwards, only a moderate increase in the total fertility rate value could be expected. The most probable scenario suggests the country will reach the overall fertility of approximately 1.45 children per woman in 2050. At the same time, a very slow but visible fertility ageing is assumed in Bosnia and Herzegovina. The intensity of childbearing up to the age of 24 years should further decrease, and at the age of 25 and higher, slowly grow during the entire forecast period.

Moreover, the long-term decline in mortality rates is over, but likely only temporarily. An increase in mortality in 2020 resulted in a profound decrease in the life expectancy of males and to a lesser extent also females. The dominant factor

of this change, COVID-19 and its direct and indirect consequences, should affect mortality for the following several years. It is expected that the life expectancy value will further decrease in 2021, and then again improve.

Similar development is expected in the case of migrations, especially its emigration component. Some restrictions on visa policy and international travel introduced during the pandemic are likely to keep the intensity of emigration somewhat lower than in previous years. However, the intensification of migration mobility may come earlier than the expected return of mortality to its position before 2020. Of course, future development will also depend on the migration attractiveness of individual countries and its redefinition.

The expected values of aggregated indicators presented in Table 1 provide an overview of resulting "aggregated" expectations on the development of population reproduction components in Bosnia and Herzegovina.

Table 1: Expected developments of population reproduction components, 2021-2070, selected years, all variants

Year	Fertility (Total fertility rate)			Mortality (Life expectancy at birth)						Migration (Migration increase)		
				Males			Females					
	low	medium	high	low	medium	high	low	Medium	high	low	medium	high
2021	1.16	1.21	1.25	71.93	72.33	72.69	77.50	77.82	78.16	-28 939	-24 088	-17 709
2025	1.30	1.36	1.39	73.50	74.10	74.67	78.74	79.27	79.75	-30 156	-22 411	-16 506
2030	1.31	1.38	1.44	74.56	75.46	76.27	79.59	80.35	81.01	-24 672	-18 747	-14 178
2040	1.32	1.42	1.50	75.94	77.35	78.45	80.54	81.82	82.78	-17 765	-14 469	-11 705
2050	1.31	1.45	1.55	77.17	79.00	80.24	81.38	83.14	84.27	-12 976	-11 545	-10 113
2060	1.29	1.47	1.60	78.21	80.43	81.90	82.13	84.27	85.66	-9 408	-9 163	-8 647
2070	1.27	1.48	1.64	79.10	81.73	83.50	82.82	85.29	86.96	-6 843	-7 342	-7 462

Source: Calculated by authors based on their forecast of the projection model parameters

In concordance with the accepted general assumptions and the long-term development of age-specific and aggregated fertility indicators values, it is assumed that overall fertility will most likely increase to 1.36 children per woman in 2025. There is no apparent reason why fertility in Bosnia and Herzegovina should be so low as in 2013-2020, during a more extended period. It is assumed that the fertility growth will begin in 2021 (Fig. 16). Further development should bring the overall fertility to 1.45 live births per woman in 2050 and slightly below 1.5 births in 2070.

The postponement of motherhood into higher ages should continue during the entire period of the forecast (Fig. 17). As the gravity point of the fertility distribution by age is moving ahead, the dynamics of this shift will very likely diminish. After all, the assumption of the future increase in total fertility is partly based on this assumption. The mean age of a mother at childbearing should grow by approximately one year during the next almost 30 years. It is only slightly more than the growth of this parameter between 2013 and 2020. Until 2070, its value should increase by several tenths of a year.

Figure 16: Expected total fertility rate, 2021–2070, all variants
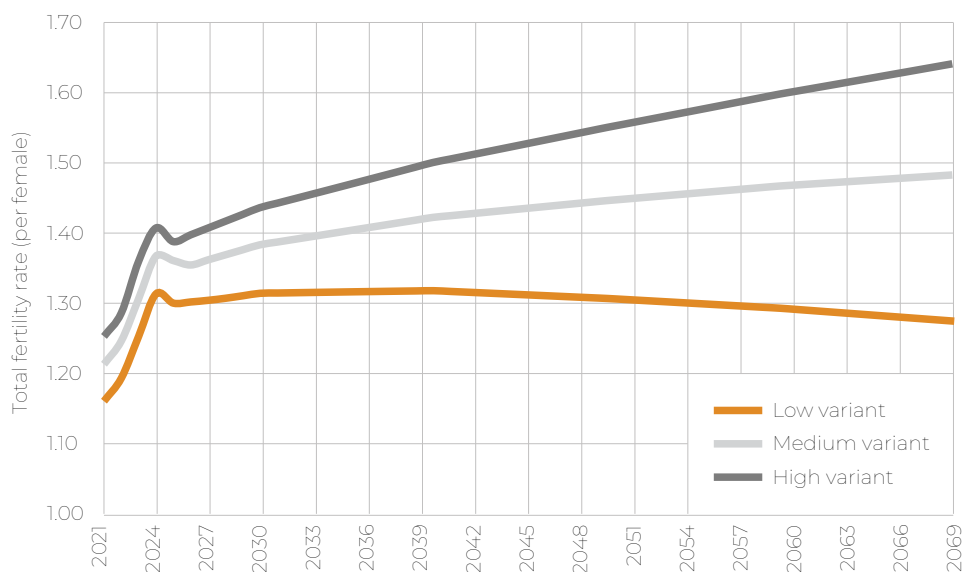
Source: Calculated by authors based on their forecast of the projection model parameters

Figure 17: Expected distribution of fertility by the age of mother, 2021–2070, selected years, medium variant
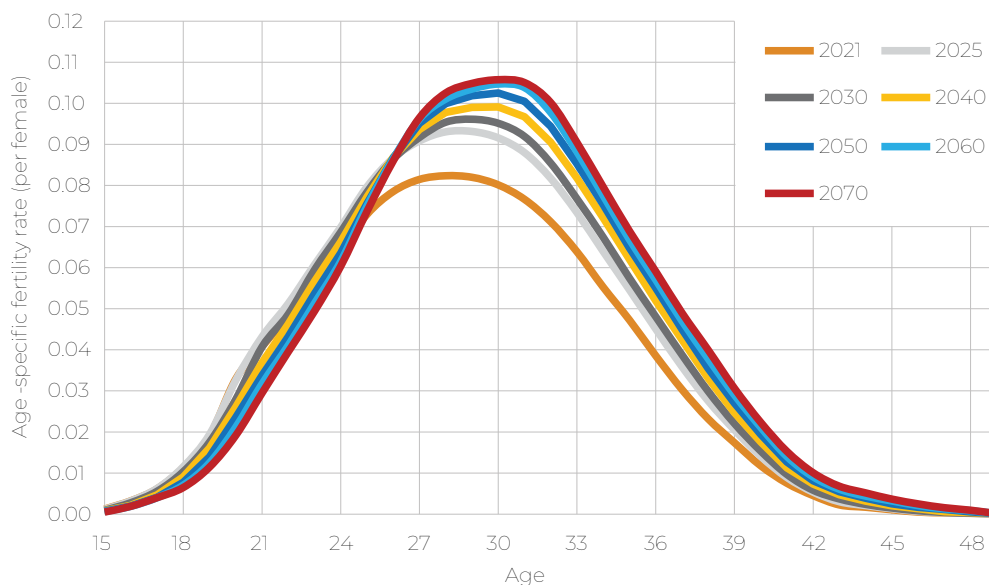
Source: Calculated by authors based on their forecast of the projection model parameters

The development of mortality will, first, reflect the recent mortality crisis caused by COVID-19. The long-term series of growing life expectancy values at birth representing the average length of male/female life in the given population and period will be interrupted by values for 2020 and 2021. Only in the following years, a gradual increase can be realistically expected. In line with assumptions, the 2019 life expectancy levels at birth should be reached earlier by females than males, most probably between 2025 and 2027. However, it can take six, seven or eight years to reach pre-COVID-19 levels or as little as two or three years according to the high variant of mortality forecast (Fig. 18). However, all these numbers are only indicative as there is still little information about the consequences of COVID-19. According to the most probable scenario, the value of life expectancy at birth could be about 83 years for females and 79 years for males in 2050 and 85 and 82 years, respectively, in 2070.

In the case of males, the increase of life expectancy at birth should be more intensive than among females due to their higher reserves in reducing mortality. In general, a faster decline in men's mortality than women's should lead to convergence of the level of life expectancy among sexes. It is expected that the estimated difference of 5.5 years 2020 will decrease to 4.1 years in 2050 and about 3.5 years in 2070 (Fig. 19).

The contributions of broadly defined age groups to the overall change in life expectancy at birth measured towards the forecast's initial year (2021) have a different structure by sex (Fig. 20 and Fig. 21). This structure reflects more significant differences in mortality between men and women and their specific mortality structures by the cause of death.

The expected increase in life expectancy for both sexes should be predominantly affected by the decrease in mortality in the age group of 60-79 years. Its share of total change could be slightly higher than 50%. Roughly one-fifth of the reduction in the overall male mortality should result from the decrease in mortality in the age group of 80+. A similar improvement is expected from the reduction of male mortality in the middle age (40-59 years). For females, the second position with the 30% contribution to the overall decrease in mortality is related to mortality improvements among the oldest women (80 years and older). The contribution of other age groups will likely be significantly lower but not negligible during the forecast period.

Figure 18: Expected life expectancy at birth by sex, 2021–2070, all variants
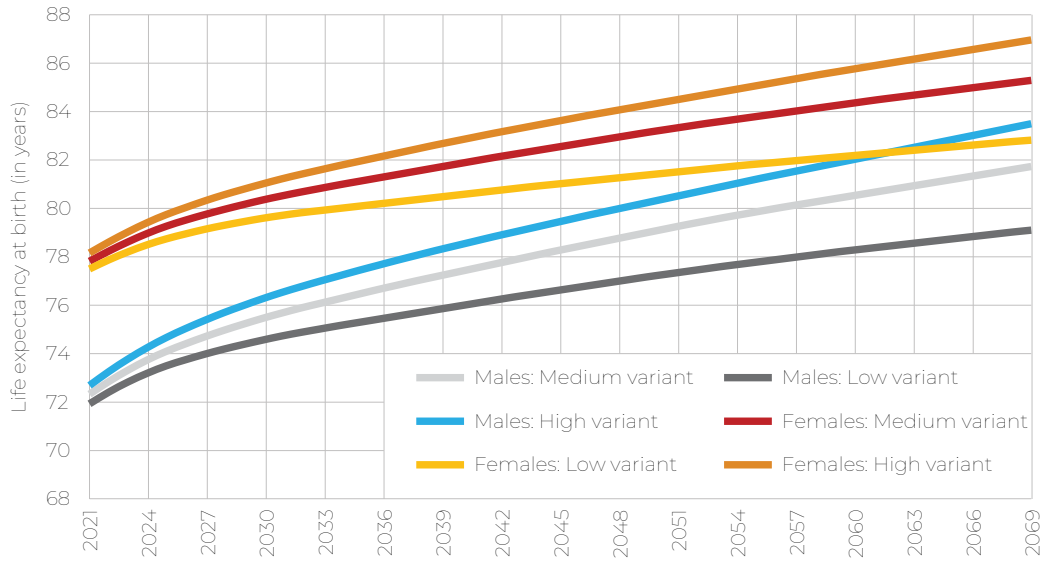
Source: Calculated by authors based on their forecast of the projection model parameters

Figure 19: Expected difference in life expectancy at birth between males and females, 2021–2070, all variants
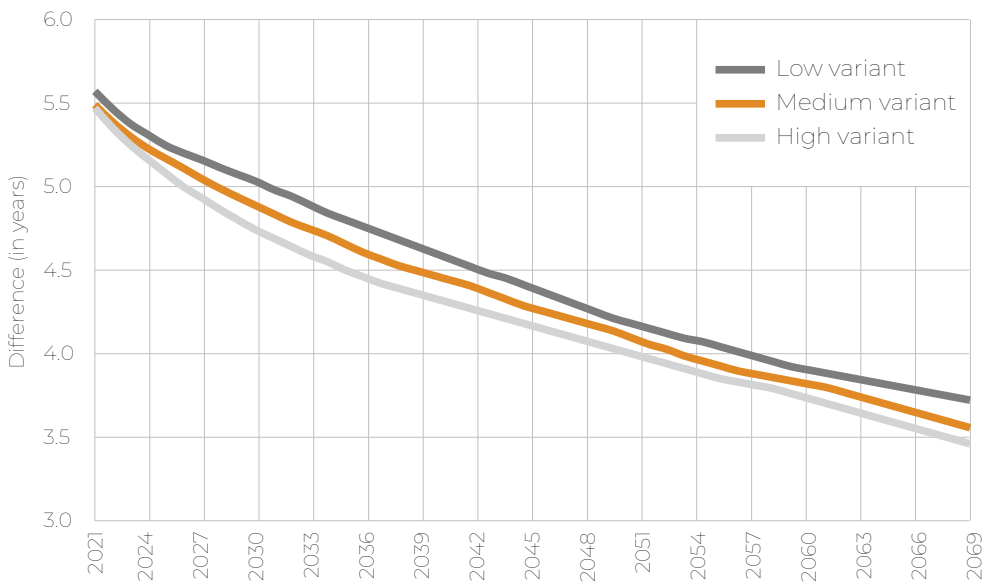
Source: Calculated by authors based on their forecast of the projection model parameters

Figure 20: Expected contribution of age groups to the total change of life expectancy at birth between 2021–2070, males, medium variant
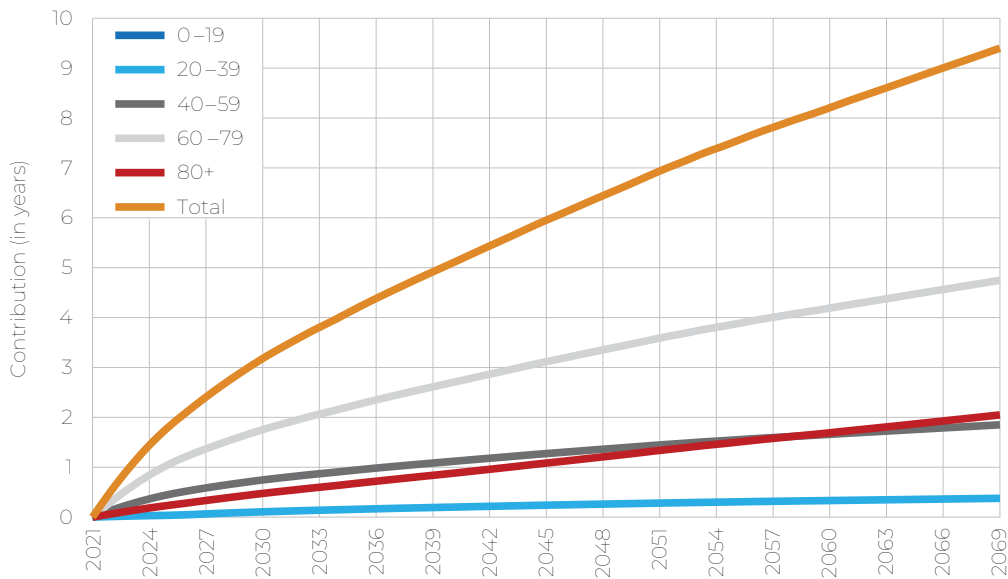
Source: Calculated by authors based on their forecast of the projection model parameters

Figure 21: Expected contribution of age groups to the total change of life expectancy at birth between 2021–2070, females, medium variant
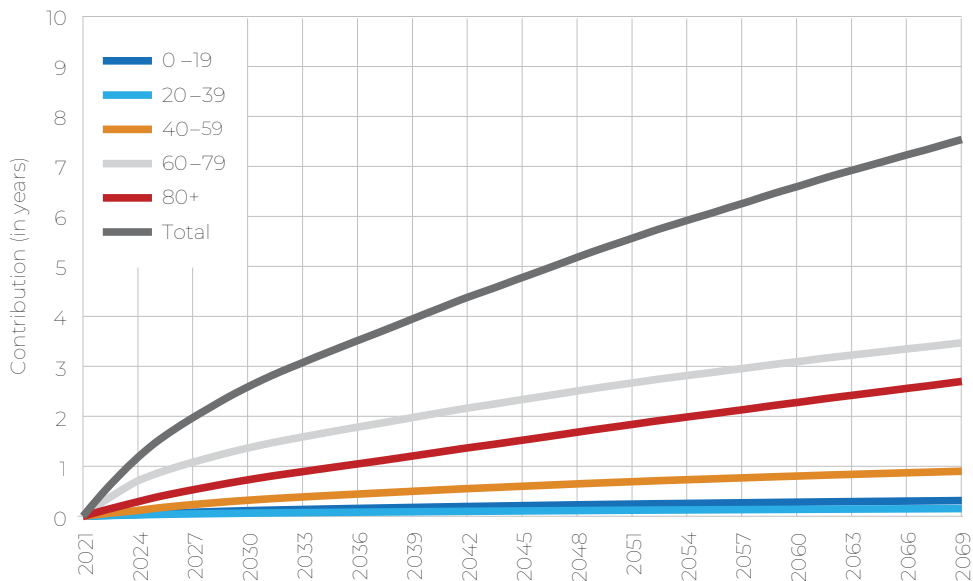
Source: Calculated by authors based on their forecast of the projection model parameters

The most complicated part of each population forecast is estimating future migrations. The highly complex causality of this process leads to its high instability in time and space. Estimating migrations even a year ahead represents a challenging task since the existence or direction, volume and structure of migration flows (especially in international migration) is often dependent on an

administrative decision. Therefore, migration forecast are usually speculative. This statement is more valid than ever in the current pandemic and security situation in the world.

It is assumed that women generally maintain higher migratory mobility in prognostic considerations than men. In the medium variant, approximately 30% higher maximal net migration was used than official international records for the past eight years for which there was the data. There were two main reasons for this assumption. Firstly, they are the compensation for the frozen part of migratory movements during epidemic restrictions in 2020 and 2021, and secondly, the fact the mobility of the population tends to grow in general.

The use of the international statistical data substantially increases the quality of the population forecast results, while anchoring the forecast assumptions solely in the country migration statistics would result in an unreliable forecast. Moreover, due to the minimal length of comparable time series, it was not possible to identify the relevant developmental regularities appropriately. Therefore, empirical profiles were applied corresponding to average distribution curves based on data from 2017 to 2019. In the case of immigration flows, the applied variables were the absolute numbers and relative structure (proportions) of immigrants by sex and age. In the case of emigration, age-specific emigration rates were used separately for males and females.

Except for the expected population balance, the following forecast results cover only stock numbers, i.e. numbers of the forecasted population's size and structure. The forecasted population for the forecast results presentation is exclusively understood as the set of all inhabitants of Bosnia and Herzegovina in the sense of their statistical definition. Any prognostic information is laden with a greater or lesser degree of uncertainty. The mutual position of the forecast variants illustrates its level regarding the medium variant´s results. However, for clarity, only those results corresponding to the forecast's medium variant were presented and discussed in the following text.

The forecast results indicate that the total number of inhabitants of Bosnia and Herzegovina will likely decline almost linearly in the next five decades. Assuming the population of the country amounted to 3.47 million persons at the end of the year 2020, then its total number should reach the mark of about 1.56 million within a realistic range defined by 1.27 and 1.81 million inhabitants by 2070 (Fig. 22). The reasons for such a dramatic drop are clear enough – low and decreasing natality due to a shrinking number of potential mothers and low fertility, a relatively high and increasing number of deaths caused by the growth of the number of older people, more dynamic than the decrease of mortality intensities, plus negative net migration.

Figure 22: Initial and expected total population size, 2020-2070 (as of Dec. 31)
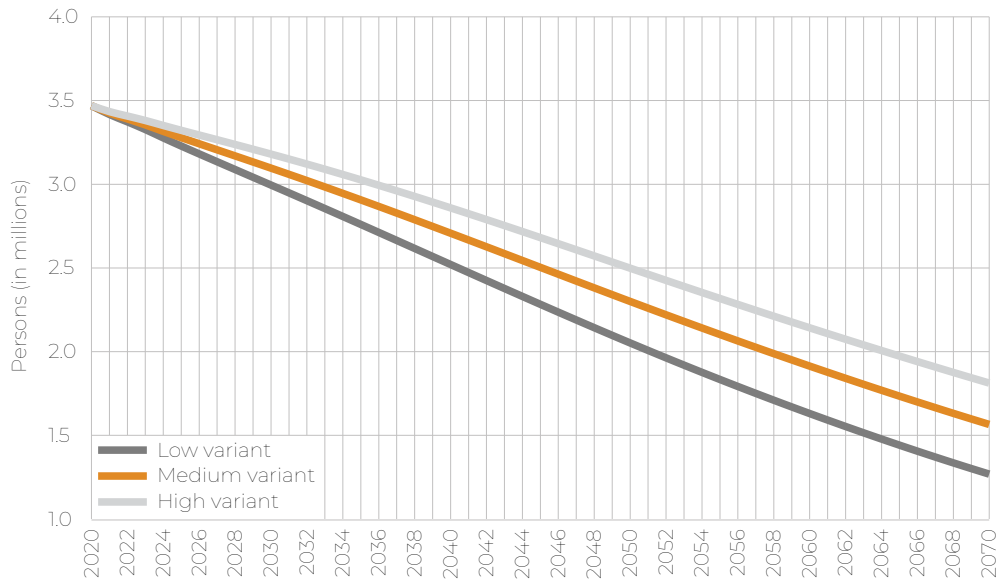
Source: Calculated by authors

The expected change represents the total population's decline by about 55%, respectively between 48% and 63% during less than 50 years covered by the forecast. The relative pace of decrease should be very similar during the entire period. The annual growth rate values are expected to be almost constant, at about 1% annually (Fig. 23). In absolute terms, the population will likely shrink by 33,000-45,000 persons annually during 2021-2070 (Fig. 24).

Figure 23: Expected relative change of total population, 2020–2070 (as of Dec. 31), all variants
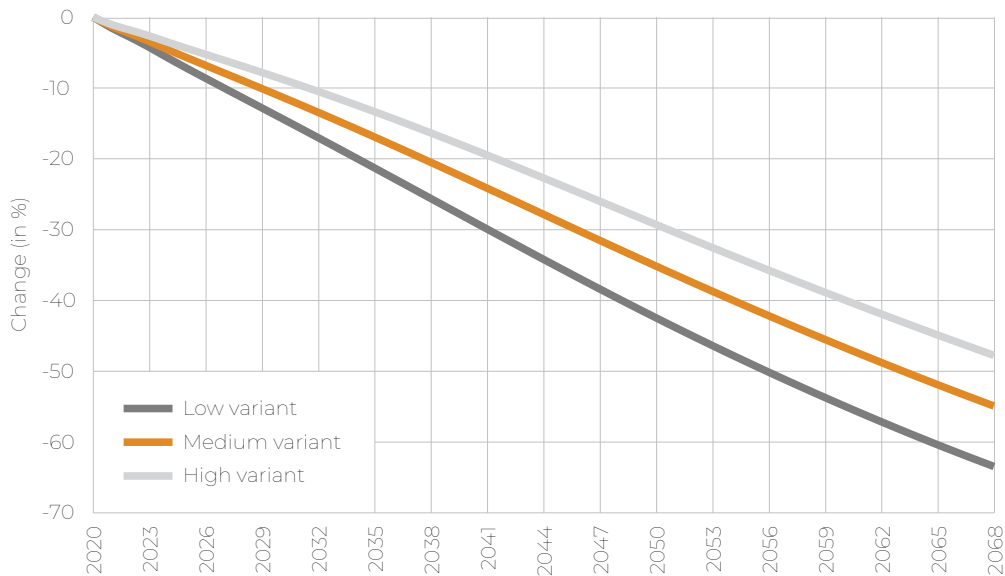
Source: Calculated by authors

Figure 24: Expected population balance, 2021–2070, medium variant
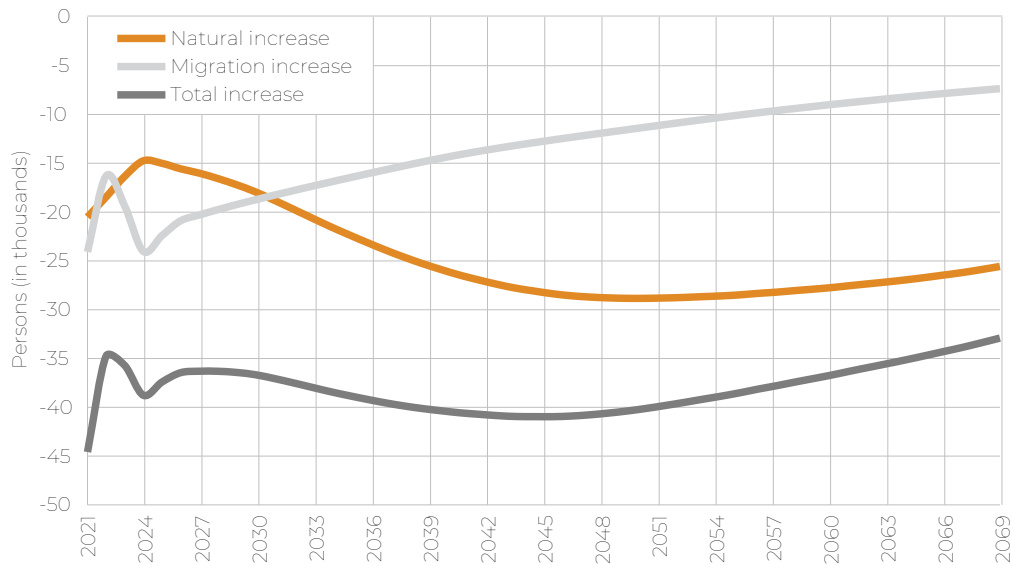
At the same time, trends in the development of aggregate components will be different. The migration loss should decrease over time, and the natural change loss should increase. In the first case, it will primarily result from the declining reproductive potential of the population of Bosnia and Herzegovina. In the latter case, it will be a consequence of the parallel development of the migration potential. Both of these potentials have a common denominator - the number or proportion of young people in the population, the driving force of reproduction and migration. It is expected the number of young people to fall even more rapidly than the number of the total population itself.

The decline in population size will be accompanied by continuing population ageing, primarily determined by the initial age structure of the population. It is expected that the mean age of the population will increase from its initial value of 42 years to unprecedented 54 years approximately, according to the medium variant, in 2070. The female population of Bosnia and Herzegovina should be, on average, about 56 years old. The male population is expected to be almost four years younger than the females at the end of the forecast period (Fig. 25). This difference in the mean age between males and females has its logic. It results from two facts – a naturally higher proportion of boys among newly born children and excess mortality of males of all ages, causing women's surplus at higher ages.

Figure 25: Initial and expected mean age of population by sex, 2020-2070 (as of Dec. 31), medium variant
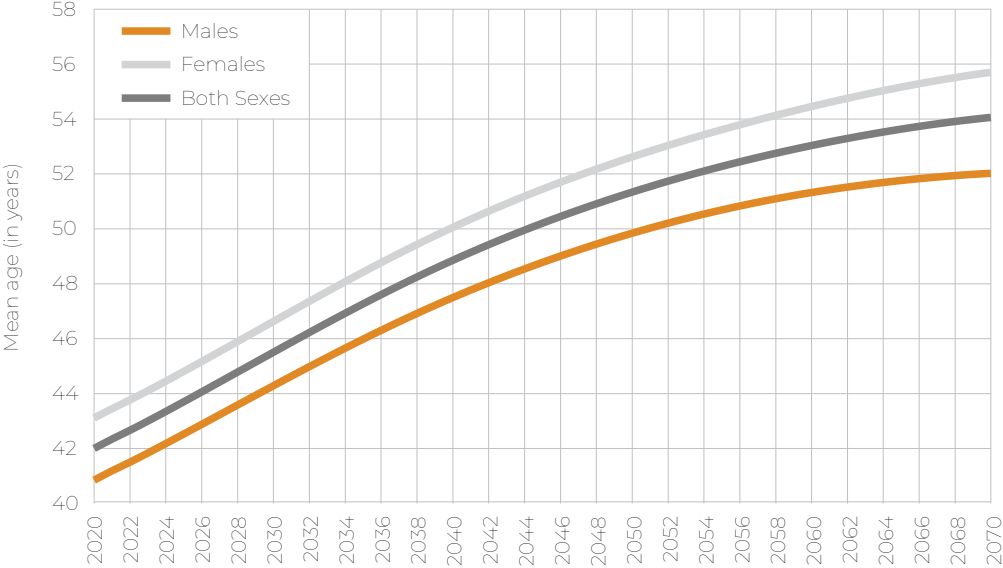
Source: Calculated by authors

The complex transformation of population age-sex structure is illustrated by a series of age pyramids in Fig. 26 to Fig. 31. They demonstrate the two-sided successive ageing process – almost certainly multiplying the number of people at the top of the age pyramid and highly likely shrinking the base, i.e. fewer, and fewer children at the bottom. Ageing from the top will result from the generational shift when numerous generations of males and females formed after WWII and from the 1960s to the mid-1980s will move into seniority.

Figure 26 Expected change of population age-sex structure between 2020 and 2025 (as of Dec. 31), medium variant
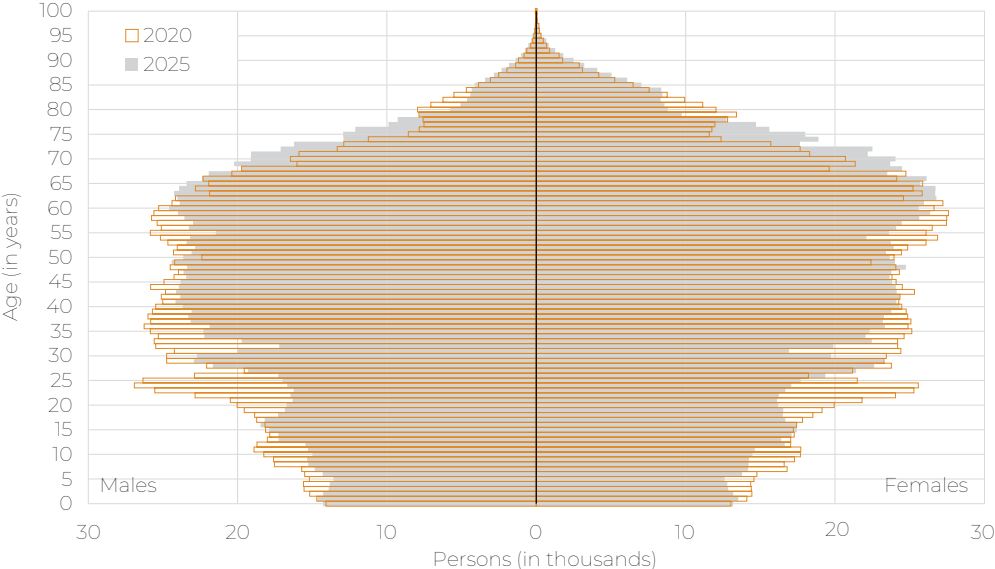
Source: Calculated by authors

Figure 27: Expected change of population age-sex structure between 2020 and 2030 (as of Dec. 31), medium variant
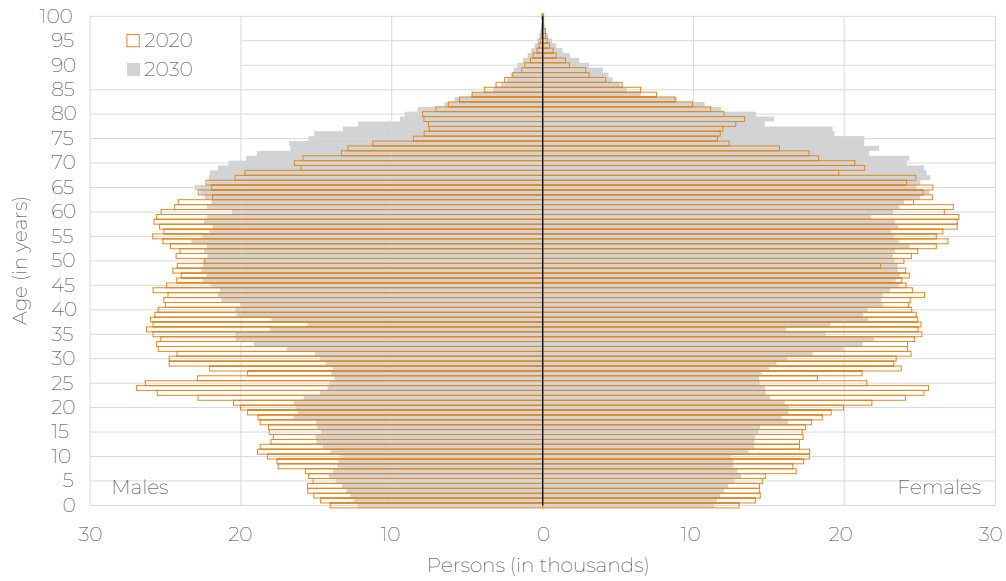
Source: Calculated by authors

Figure 28: Expected change of population age-sex structure between 2020 and 2040 (as of Dec. 31), medium variant
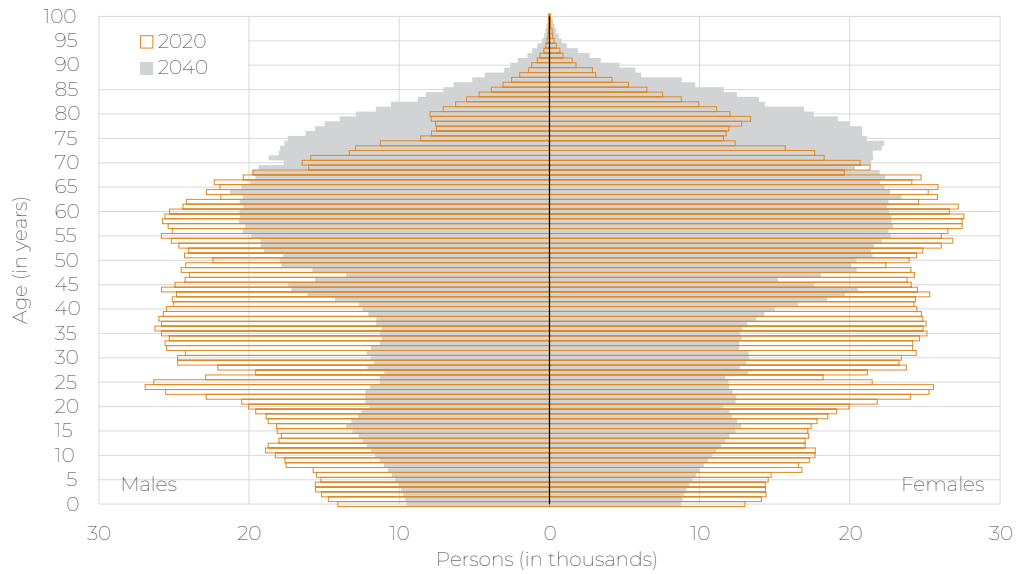
Source: Calculated by authors

Figure 29: Expected change of population age-sex structure between 2020 and 2050 (as of Dec. 31), medium variant
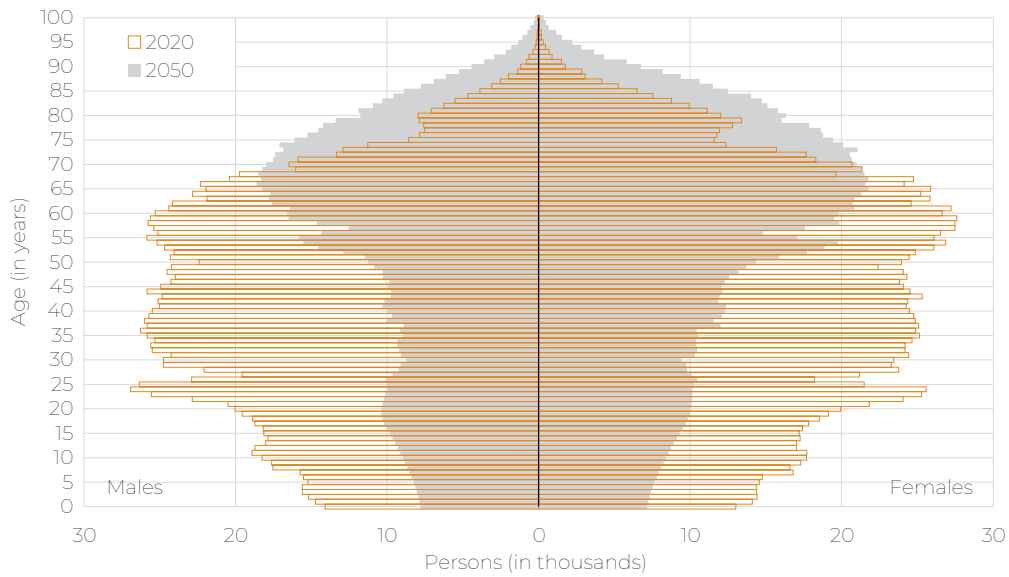
Source: Calculated by authors

Figure 30: Expected change of population age-sex structure between 2020 and 2060 (as of Dec. 31), medium variant
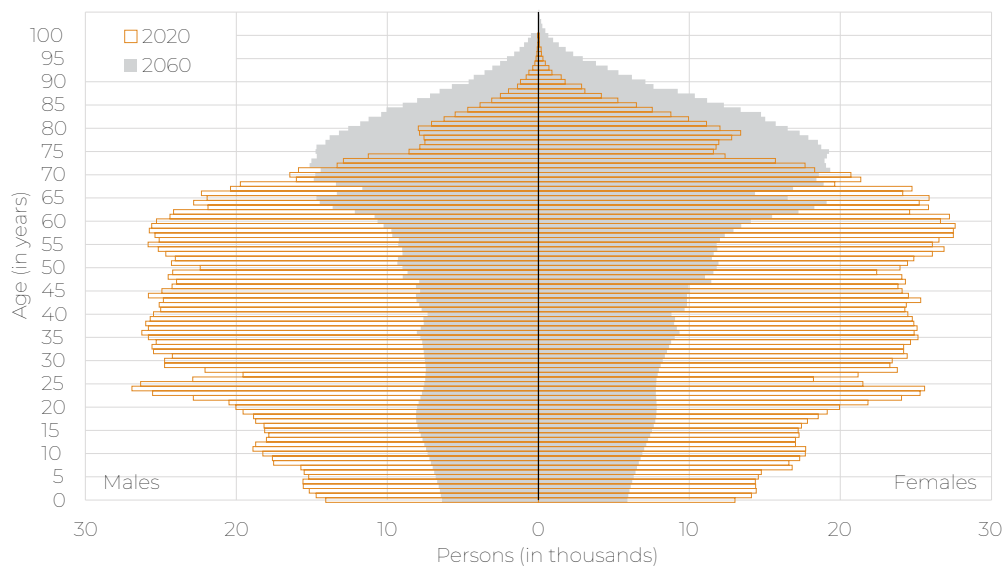
Source: Calculated by authors

Figure 31: Expected change of population age-sex structure between 2020 and 2070 (as of Dec. 31), medium variant
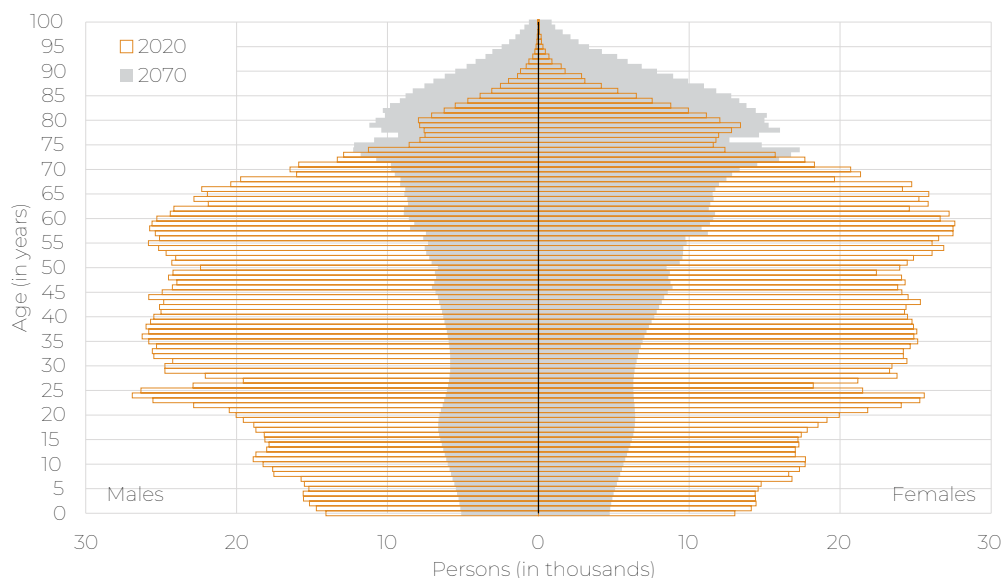
Source: Calculated by authors

If using the standard European definition of economically productive age (20-64 years), it could be concluded that this population segment size achieved approximately 2.2 million people at the end of 2020. After 30 years, by the end of the year 2050, this age category size should be at about half of its original size (1.1 million inhabitants). It will very likely shrink further by 2070.

As a result, it could be expected that there will be only about 680,000 inhabitants of productive-age in 2070. This number represents one-third of the default value (Fig. 32). The highest absolute decrease will likely occur in the 2030s, when Bosnia and Herzegovina should lose, mainly through migration and demographic ageing, about 350,000 persons of productive age. In addition, its working-age population will age significantly. Relative decrease in this category, expressed by a negative growth rate, will likely reach its highest intensity in the second half of the forecast period. The proportion of the population at productive age, which was relatively high (63.5%) at the end of 2020, should reach slightly less than 50% in 2050 and further develop to the unprecedently low value of about 43% in 2070 (Fig. 33).

Figure 32: Initial and expected size of main age categories, 2020–2050 (as of Dec. 31), selected years, medium variant
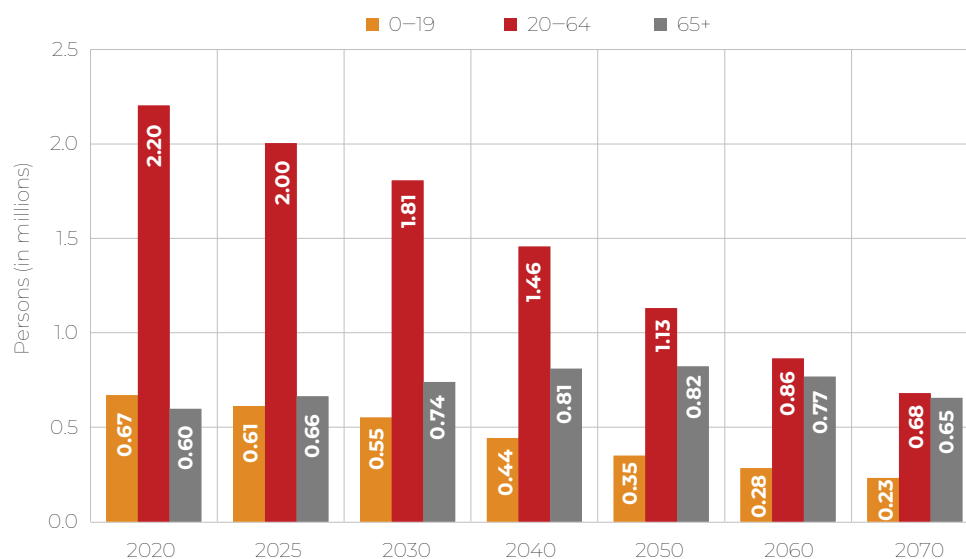
Source: Calculated by authors

Figure 33: Initial and expected proportion of the main age categories, 2020–2050 (as of Dec. 31), selected years, medium variant
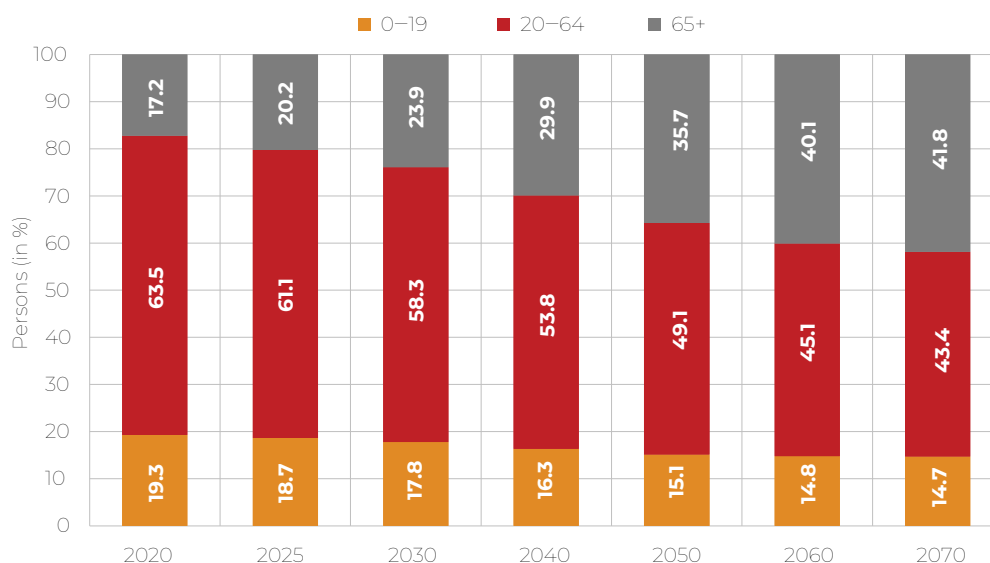
Source: Calculated by authors

The changes like those just described are expected in the case of the pre-productive component of the population (0-19 years). The number of children and adolescents until 19 years of completed age will likely drop from 669,000 in 2020 to about 350,000 after the first 30 years and approximately 230,000 at the end of the forecast period. The intensity of the expected decrease should be almost identical to the decline of the population in productive age by around 10% during the first decade and double in the following decades. The proportion of this age category to the total population should diminish by "only" about four

percentage points, from the recent 19.3% to approximately 15% in the mid of this century and at the end of the forecast period as well.

If the numbers of the total population, children and adolescents and working-age population rapidly decrease, the number of older persons will probably increase. This growth will be rather intensive during the first two decades. A slightly less than 600,000-strong contingent of older people in 2020 should grow above 820,000 persons at age 65+ within the following 30 years. After 2048, the number of older persons in Bosnia and Herzegovina is expected to decrease. Nevertheless, its share will likely grow continuously from 17.2% at the end of 2020 to almost 36% in 2050 and 42% in 2070. It is approximately twice the proportion of older persons in the ageing western societies today.

Such development will be a real challenge for the entire social system of the country and its sustainability. Since all the persons being or expected to be in post-productive age during the forecast period are already born and reached adulthood, one could forecast their numbers with much higher reliability than any other population parameters. It means that the conclusions regarding this main parameter of population ageing can be pronounced with relatively high certainty, especially in the first thirty years of the forecast period. The reason for this is that all the future older persons (65 years and older) are 35 and more today. Participation of these persons in international migration and the probability of (permanent) emigration is already meagre.

The population's division into three basic age categories is too rough in terms of economic and social development management. Therefore, a more detailed insight is required for some "functional" age groups, especially in segments demanding more attention from society, such as children, adolescents and older persons. The following charts illustrate analogous development of the numbers of children and young people divided into special age groups referring to different levels and stages of education, preparation for employment, and/ or the initial years in the labour market and their own family life (Fig. 34). The numbers of older persons in the overlapping age groups should also undergo similar changes (Fig. 35).

Figure 34: Expected relative change of the numbers of children and young people by specific age groups, 2020–2070 (as of Dec. 31), medium variant
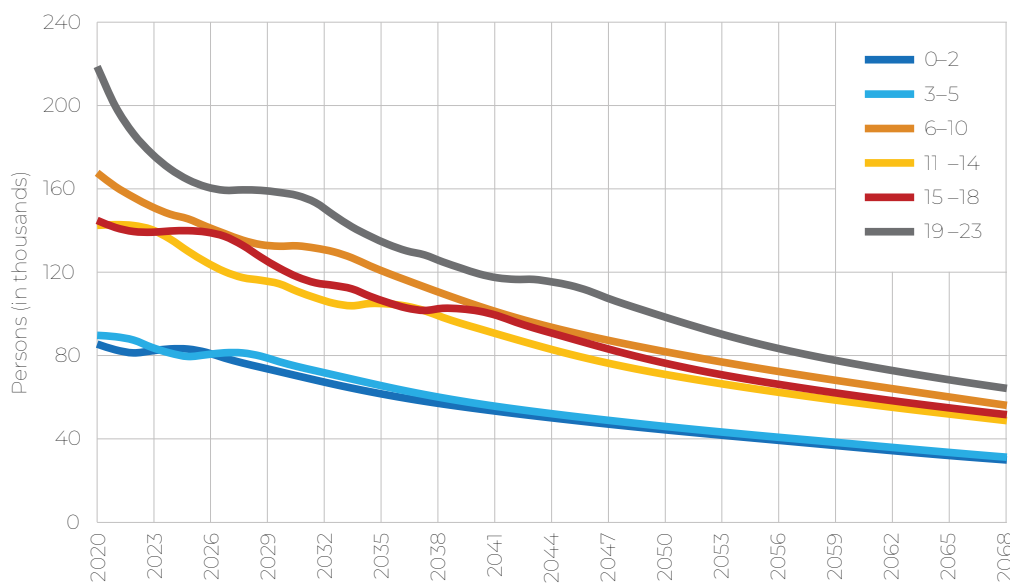
Source: Calculated by authors

Figure 35: Expected relative change of the number of older persons by specific age groups, 2020–2070 (as of Dec. 31), medium variant
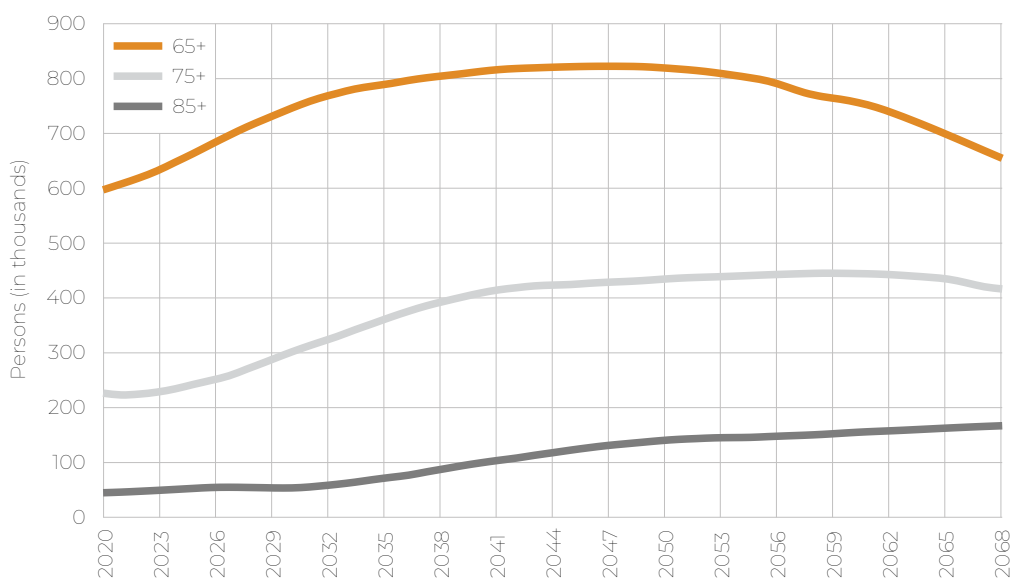
Source: Calculated by authors

In the case of the contingent of children and young people at the age of preparation for employment and their sub-categories, a univocal decrease in the order of dozens of per cent is expected. The size of the entire contingent of children and adolescents at age up to 23 years should decrease from recent 849,000 to less than 430,000 persons in 2050 and about 280,000 people in 2070,

i.e. by about one-half and two-thirds, respectively. For the older sub-group, the more profound decrease is expected due to its larger initial size.

Among the categories of older persons, the centre of gravity will shift from younger to oldest-old persons in the coming decades. The share of the oldest-old (85 and over) among the overall older persons represented approximately 7% at the beginning of the forecast period in 2020. After 30 years, it should increase to about 17% and more than a quarter (26%) of the total population by 2070.

A similar proportion of middle-aged older persons (75-84 years) should grow from the initial 30% to 36% and 38% in the corresponding years, and the share of younger older persons (65-74 years) is expected to decrease from 62% in 2020 to 47% in 2050 and 36% in 2070. The development of the sub-populations in the pre-productive and early working age will probably not enforce an additional social expenditure. It will, however, by no means apply to the other end of the age pyramid of the post-productive age. The increase in the number of older persons will cause a significant rise in entitlements to pension insurance, health care and social protection covered from the public budgets.

PENSION SYSTEM IN BOSNIA AND HERZEGOVINA

Under Annex 4 of the Dayton Peace Agreement for Bosnia and Herzegovina, the pension and disability insurance system is assigned to the entities of Bosnia and Herzegovina. The Institute for Pension and Disability Insurance of the Federation of BiH began to work on January 1, 2002 in accordance with the Law on the Organization of Pension and Disability Insurance in the Federation of Bosnia and Herzegovina.[6] The main activity of the Institute is the pension insurance implementation in accordance with the Law on Pension and Disability Insurance.[7]

Similarly to the Federation of BiH, the authority of the Republika Srpska is recognized through the Law on Pension and Disability Insurance, under which the Republika Srpska regulates and provides, among other things, social insurance and other forms of social protection of citizens.[8] In 2016, the system of pension and disability insurance in the Republika Srpska switched to treasury operations, while the same was done in the Federation of BiH in 2020. In practice, this means that all revenue from labour contributions is the revenue of the entity budgets, but it also means that pensions are paid from the entity budget, while the gap between the smaller revenue from labour contributions and the expenditure for financing pensions is covered from other sources, such as revenue from VAT and excise duties.

Figure 36: Number of pensioners in Bosnia and Herzegovina, 2014-2021
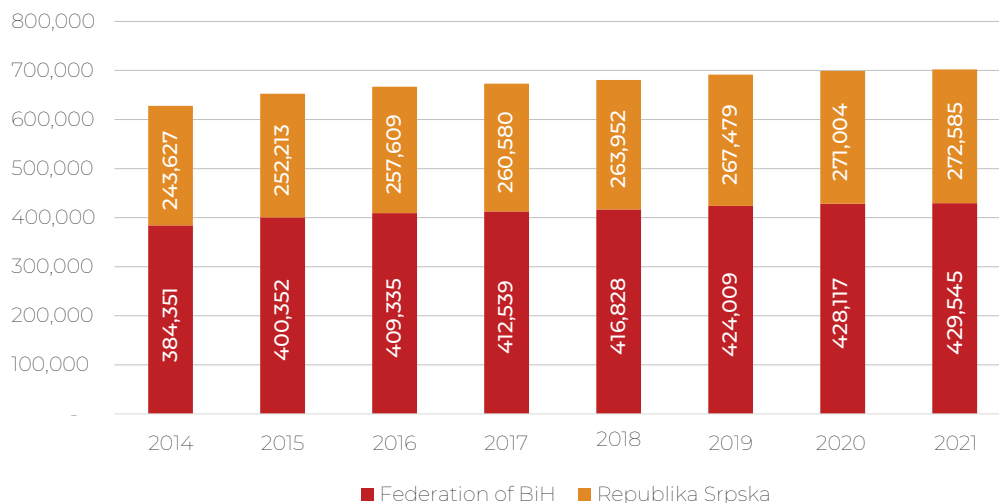
Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

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[6] *https://www.fzmiopio.ba/informacije-o-zavodu/*

[7] *https://fbihvlada.gov.ba/bosanski/zakoni/1998/zakoni/36%20b%20penzijsko%20i%20invalidsko%20osiguranje.htm*

[8] *https://www.fondpiors.org/mi-smo/*

Although this pension payment model is acceptable from the point of view of pensioners as it guarantees them regular income, insufficient labour contribution payments with the ageing of the population and slow economic growth lead to ever increasing expenditure for pensions from other sources of financing, such as indirect taxes, which leaves fewer public funds for investment in development.

According to the entity pension and disability insurance funds (Fig. 36), a constant net increase in the number of pensioners in Bosnia and Herzegovina was recorded between 2014 and 2021. In 2014, the total number of pensioners in Bosnia and Herzegovina was 644,179, of which 394,900 were in the Federation of BiH, and 249,279 in the Republika Srpska. This number increased significantly during the period under review, so that at the end of 2021 it amounted to 702,130, of which 429,545 in the Federation of BiH and 272,585 in the Republika Srpska. This represents an increase in the number of pensioners in this period by 11.8 percent at the level of Bosnia and Herzegovina (11.8 percent in the Federation of BiH and 11.9 percent in the Republika Srpska).

Figure 37: Annual net increase in the number of pensioners in Bosnia and Herzegovina, 2014-2021
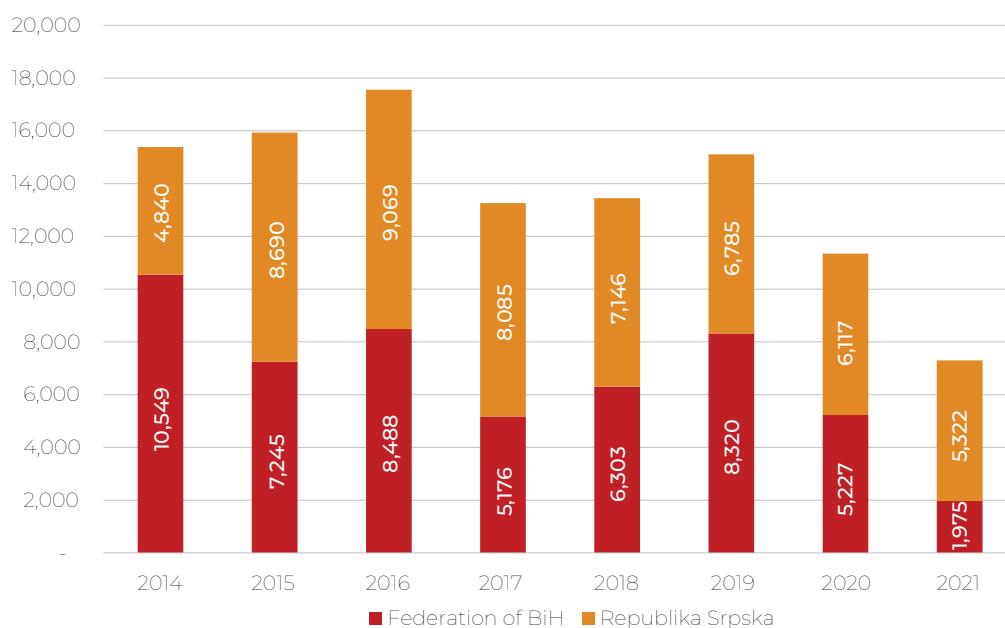
Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

If changes in the number of pensioners are observed on annual basis (Fig. 37), it could be concluded that a net increase in the number of pensioners was significant each year until 2020 and the onset of the COVID-19 pandemic, when growth slowed down, which can partly be explained by an increased mortality rate of this population in that period.

Based on the increase in the number of pensioners over the observed period, the annual expenditures for payment of pensions increased equally. Observed by years (Fig. 38), in 2014, 2.66 billion BAM were paid in pensions, while in 2021, 3.6 billion BAM were needed to finance pensions annually, which is an increase of 742.8 million BAM over the period of eight years, or 27.9 percent.

Observed by entities, the Federation of BiH accounts for 482.4 million BAM of this increase in expenditure for pensions, and the Republika Srpska accounts for 260.5 million BAM. In relative terms, the increase in the Federation of BiH was 28.2 percent and in the Republika Srpska 27.5 percent. This is a direct consequence of the growth in the number of pensioners based on the right to old-age retirement, where the number of beneficiaries increased by 99,043, which is significantly more than an overall increase in the number of pensioners, as there was an exit of some beneficiaries from the disability and survivor pension system.

Figure 38: Annual expenditures for pensions in Bosnia and Herzegovina, 2014-2021
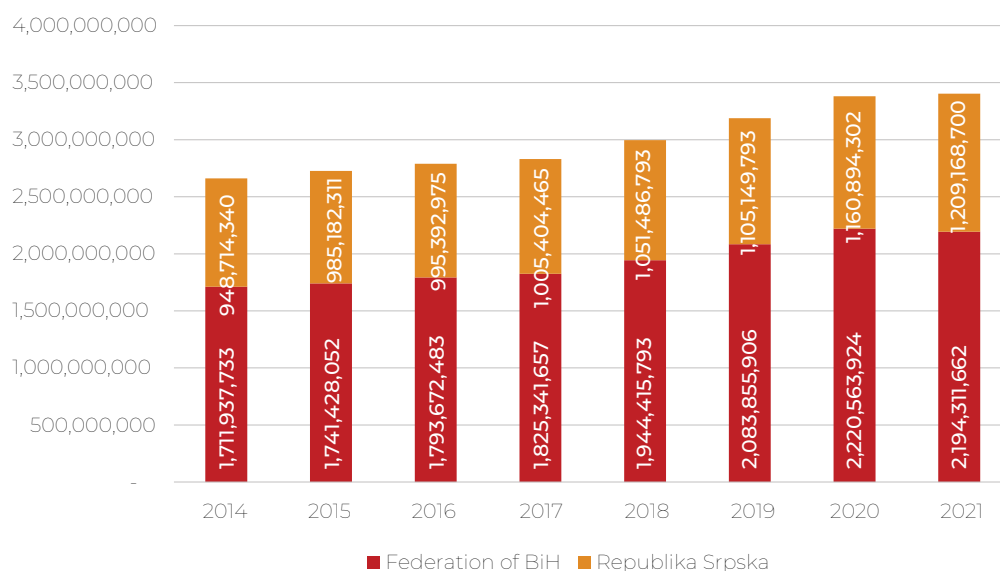
Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

In order to develop a model of expenditures for pensions in Bosnia and Herzegovina, it is first and foremost necessary to understand the labour force and employment trends in the country. Although the Labour Force Survey conducted by BHAS provides more accurate statistical data in regard to the labour force and employed/unemployed population, this survey identifies all persons who obtained any income in the period prior to the survey no matter if their income comes from registered employment or work in the grey market. As the pensions rely largely on paid contributions from registered employees, LFS data could not be used due to a high number of working-age population working

in the grey market and who do not pay any taxes and contributions into entity budgets. Instead, data obtained from entity tax offices was used as it contains information on formal employment and payment of taxes and other labour contributions.

The labour force, by definition, includes the number of employed and unemployed persons, which means that if an increase in employment and a decrease in the labour force are expected, that number will be provided from unemployed persons and inactive population, which can be a particular long-term challenge in view of the age structure of the working age population in Bosnia and Herzegovina.

According to the LFS data from 2018, 42% of the workers are at the age of 50 or older. Also, the activity rate in Bosnia and Herzegovina is very low and amounted to 48% in the first quarter of 2022, while the number of people outside the labour force was 1.49 million. Of this number of persons who are out of the labour force, 0.93 million were women, which is 61.8 percent of the total number of inactive persons. However, there were limitations in the estimation of the labour force trends using the data of registered employed and unemployed persons, as the time series of the employed people is available only for the period December 2017 - June 2022, while the times series for unemployed persons are available for longer period of time.

Figure 39: Model projections of employment and labour force trends in Bosnia and Herzegovina, 2022-2031

Source: Created by author based on data of the BiH Agency for Statistics and the BiH Agency for Labour and Employment

According to model projections (Fig. 39), the labour force in Bosnia and Herzegovina will decrease from 1,206 million in 2022 to 1,114 million in 2031 in its medium variant (with interval ranging from 1,111 million for lower variant to 1,118 million for upper variant). Ultimately, the labour force reduction, according to the current forecast and calculations, will likely amount to 92,025 people over the next 10 years. These data present a reason for concern as future economic growth will be limited due to the reduction of the labour force, which will also create additional pressure on the functioning of social services in the country. Here, it is necessary to emphasise that the above presented population s use latest census data corrected only for vital statistics (number of new-borns and deaths) as a starting point while the country does not produce migration statistics. In practice, knowing the high level of emigration of skilled workers from the country, this means that the starting point for calculation of population forecast is already much lower and the fall in the number of labour force is going to be even steeper.

Table 2: Model projections of trends in employment in Bosnia and Herzegovina, 2022-2031

YEAR	LOWER FORECAST VARIANT	FORECAST	UPPER FORECAST VARIANT
2022	826,868	836,245	848,021
2023	835,676	845,152	857,054
2024	844,577	854,154	866,182
2025	853,573	863,252	875,408
2026	862,664	872,447	884,733
2027	871,853	881,740	894,157
2028	881,140	891,132	903,681
2029	890,525	900,624	913,306
2030	900,010	910,216	923,034
2031	909,597	919,912	932,866

Source: Created by author based on data of the BiH Agency for Statistics

At the same time, an increase in employment in Bosnia and Herzegovina is estimated at 83,667, which is an increase of 10% over 10 years (Table 2). This increase is much smaller compared to the previously mentioned period, from 2017 to 2022, when an increase amounted to a similar percentage of growth but during a period almost twice as small.

The trend in the number of workers in Bosnia and Herzegovina in the next ten years is the first indicator of the impact of demographic trends on the sustainability of the system of social services in Bosnia and Herzegovina. Although the transition of the pension system to entity budgets has brought

stability and security into the payments of pensions, as pensioners are among the first in the payment queue, the sustainability of other segments of the economy, and ultimately the level of real pension growth, depend on the level of labour contribution collection.

Table 3: Projection of the number of pensioners in Bosnia and Herzegovina, 2022-2031

YEAR	LOWER FORECAST VARIANT	FORECAST	UPPER FORECAST VARIANT
2022	708,429	711,431	714,773
2023	718,479	721,524	724,914
2024	728,672	731,761	735,198
2025	739,010	742,142	745,628
2026	749,494	752,671	756,206
2027	760,127	763,349	766,935
2028	770,911	774,178	777,815
2029	781,848	785,162	788,850
2030	792,940	796,301	800,041
2031	804,189	807,598	811,391

Source: Calculated by author

A projection of the trend in the number of pensioners for the period 2022 - 2031 (Table 3) shows that the number of pensioners will likely increase from 711,431 in 2022 to 807,598 in 2031 in its medium variant (with interval ranging from 811,391 for lower variant to 804,189 for upper variant). According to these model projections, the number of pensioners will likely increase by 96,167 over the next 10 years.

Figure 40: Projection of the number of pensioners in Bosnia and Herzegovina, 2022-2031
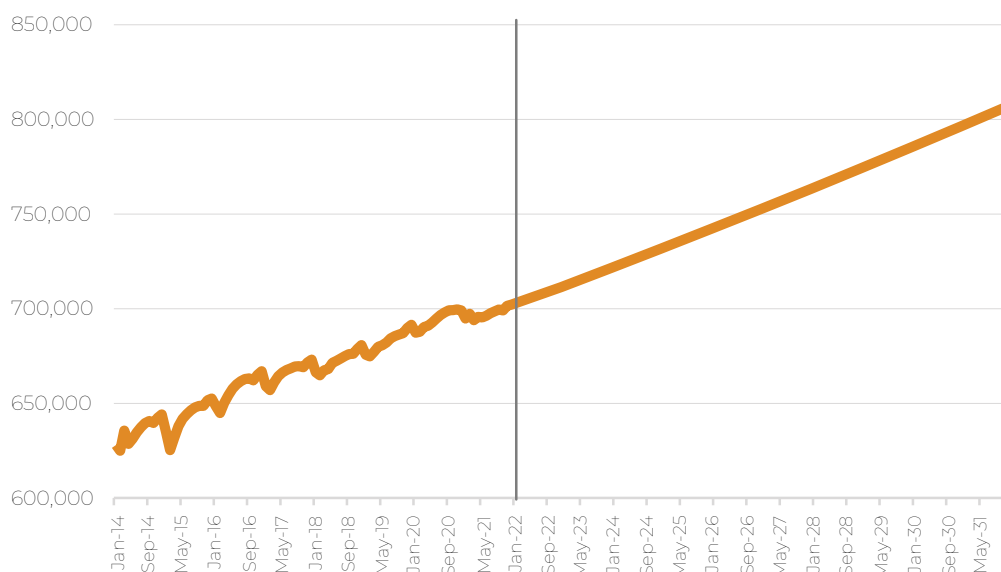
Source: Created and calculated by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

This is a direct consequence of the increase in the number of old-age pension beneficiaries, where the number of old-age pension beneficiaries will be greater than the total net increase in the number of pensioners, but due to a decrease in the number of disability and survivor pension beneficiaries, there will be a smaller increase in the total number of pensioners.

Comparing the increase in the number of pensioners with the increase in employment is not easy due to the lack of data availability on the number of employees and pensioners for same time frame. Nevertheless, a comparison of the available data from November 2017 to end of 2021 shows that the worker to pensioner ratio slightly increased from 1.12 to 1.19, which can be explained by the temporary slowdown in the growth of the number of pensioners as the consequence of higher mortality of this population during the COVID-19 pandemic. However, in the long term, this will have little impact on the proportion of pensions paid through labour contributions to entity pension and disability insurance funds and the significant funds will have to be added annually from entity budgets to cover all pensions.

Besides the estimates of the future number of pensioners, attention was put on the purchasing power of future pensioners and the effects of pensions on poverty of pensioners. For this purpose, the real pension was used as such pension is aligned with inflation and better shows purchasing power of pensioners.

Through this analysis, the projection of the trend in average real pensions in Bosnia and Herzegovina showed that an average pension is expected to grow

from 408 BAM in 2022 to 493 BAM in 2031 (Table 4) in medium variant (with interval ranging from 487 BAM for lower variant to 499 BAM for upper variant), which represents a cumulative increase of 85 BAM on monthly basis or 20.8 percent over the next 10 years.

Considering the large number of possible challenges in the future, this level of increase of an average pension will not be sufficient for an increase in the quality of life of this population to happen. It is expected that an average real pension in 2031 will represent approximately 40 percent of an average real salary in Bosnia and Herzegovina[9] (Fig. 41).

Figure 41: Projection of the trend in an average real pension and salary in BiH, 2022-2031
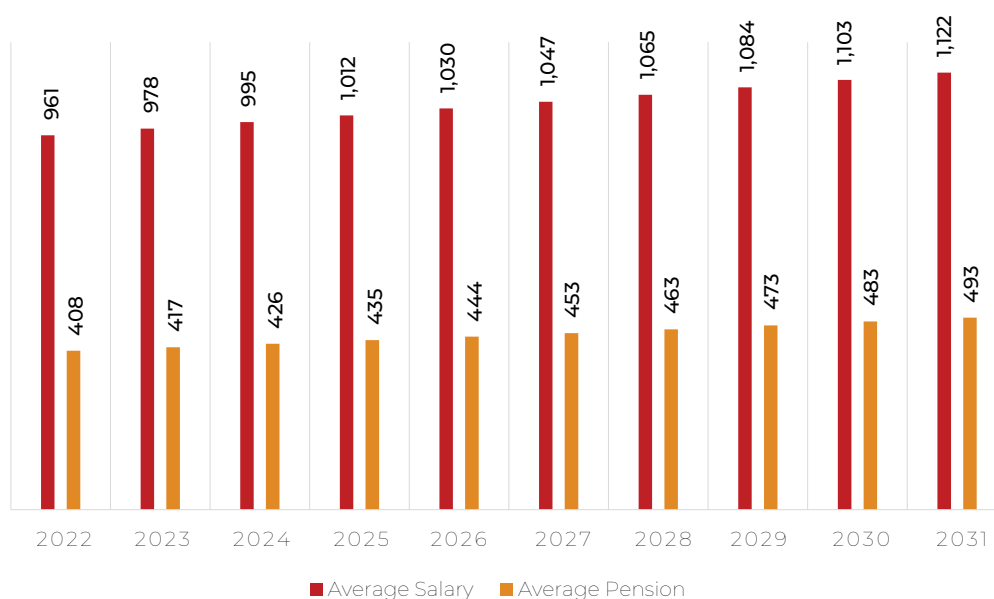
Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH, the Pension and Disability Insurance Fund of the Republika Srpska and the BiH Agency for Statistics

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[9] *Increasing the average pension significantly is very challenging and, pure mathematically speaking, it requires either increasing the contribution tax rate, increasing other taxes, or reducing other expenditures and transferring freed funds to finance pensions. For example, an increasing average pension from 408 to 750 KM would require increasing monthly tax revenues or collected contributions from 289 million to 527 million KM, which is an 82% increase. On an annual level, it would increase from 3,46 to 6,32 billion KM, which is, comparing the current GDP of Bosnia and Herzegovina, increase from 9,1% to 16,7% of the GDP. This scenario is not realistic.*

Table 4: Projection of the trend of growth of average real pension in Bosnia and Herzegovina, 2022-2031

| YEAR	LOWER FORECAST VARIANT	ESTIMATED REAL AVERAGE PENSION	UPPER FORECAST VARIANT
2022	404	408	413
2023	412	417	422
2024	421	426	431
2025	430	435	440
2026	439	444	449
2027	448	453	459
2028	457	463	468
2029	467	473	478
2030	477	483	488
2031	487	493	499

Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

In the aggregate, during the period 2022-2031, the share of pensioners in the total number of population will likely increase by 2.52 percent, which will mean that their share will increase from about a fifth in 2022 to almost a quarter of all population in 2031. This may lead to the retirement age shifts, which will significantly shorten the possible period for exercising the entitlement to pension.

The reduction of the working-age population and the growth of the 65+ population will contribute the most to this. On the other hand, the previous mild growth in population activation and labour force employment, as well as the low current growth rate of the economy of Bosnia and Herzegovina which was in the range from 0.87% (2010) to 3.74% (2018), will further worsen the pensioner standard in BiH. Fig. 41 shows that the growth of average real salaries is expected to be higher compared to the growth of pensions, which will ultimately affect the living standard of pensioners.

Table 5: Projection of the trend in an average real pension in BiH in the period 2022-2031

YEAR	AVERAGE PENSION (KM)	NUMBER OF PENSIONERS	MONTHLY PENSION EXPENDITURES IN MILLION KM	ANNUAL PENSION EXPENDITURES IN BILLION KM	GDP IN BILLION KM	PENSION EXPENDITURE / GDP (IN %)
2022	408	711,431	290	3.49	34.81	10.01
2023	417	721,524	301	3.61	35.70	10.11
2024	426	731,761	312	3.74	36.61	10.21
2025	435	742,142	323	3.87	37.55	10.31
2026	444	752,671	334	4.01	38.51	10.41
2027	453	763,349	346	4.15	39.49	10.51
2028	463	774,178	358	4.30	40.50	10.62
2029	473	785,162	371	4.45	41.53	10.72
2030	483	796,301	384	4.61	42.59	10.83
2031	493	807,598	398	4.78	43.68	10.93

Source: Created by author based on data provided by the Pension and Disability Insurance Fund of the Federation of BiH, the Pension and Disability Insurance Fund of the Republika Srpska and the BiH Agency for Statistics
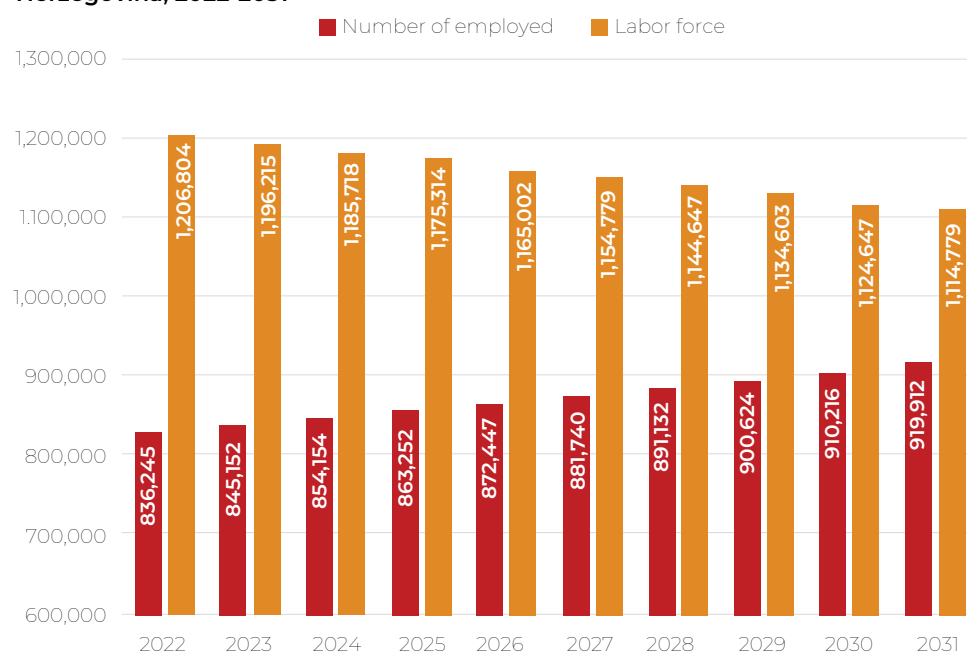
HEALTH SYSTEM IN BOSNIA AND HERZEGOVINA

The health system in Bosnia and Herzegovina is extremely fragmented, complex and decentralised resulting in considerable inefficiencies in administration, limited risk pooling, and multiple inequalities among beneficiaries (IMF, 2022; ILO, 2022)

In the Federation of Bosnia and Herzegovina, it comprises 11 ministries, 11 insurance funds, 11 health institutes, 18 hospitals, 80 primary health care centres, and various other institutions at the entity, cantonal, and municipal levels. In the Republika Srpska, it is run by the central government and consists of one ministry, one insurance fund, an institute of public health, a university clinical centre, 12 hospitals, 55 primary health care institutions (at the municipal level), and 6 health institutes. Brčko District has a department of health, one insurance fund, one hospital, and one primary health care institution. There is a medicines agency at the state level, but its authority has been recently challenged by the RS government (IMF, 2022).

Health indicators of Bosnia and Herzegovina are in line with regional peers but fall well short of the EU average. Total health expenditures per capita in BiH is USD 1,378, slightly higher than the average in Western Balkans but just one third of the EU average. Healthy life expectancy, at 67.2 years, is in line with Western Balkans but below 70 in the EU. When it comes to infant deaths, hospital beds, nurses and midwives, and physicians per capita, BiH lags far behind the EU, and trails some regional peers (IMF, 2022).

Despite the legal intention to achieve universal health coverage, the percentage of population covered by health insurance stood at 85.9 percent (78.7 percent for the RS and 89.7 percent for the FBiH) in 2017, but effective coverage is considerably less due to non-portability between funds and strict contribution requirements (ILO, 2022).

The total health expenditure was 9.0 percent of gross domestic product in 2019. However, only 70.6 percent of the health expenditure is financed by public sources and the remaining 29.4 percent of health expenditure is paid by households as out-of-pocket payments (ILO, 2022). However, this figure would be significantly higher if the corruption costs taken into consideration[10].

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[10] *According to a research study conducted by two NGOs ("Kap" Sarajevo and "Stop mobbing" Trebinje), 80% of patients are obliged to pay physicians and nurses for their services (see https://www.klix.ba/vijesti/bih/u-bih-80-posto-gradjana-daje-mito-ljekarima-ali-niko-ne-prijavljuje/211011143).*

According to United Nations Office on Drugs and Crime (2011:11):

> "Interestingly, one of the first 'Diagnostic survey on corruption' developed by the World Bank was conducted in Bosnia and Herzegovina in 2006. According to this survey, 20 per cent of the population had to give a bribe to a civil servant; moreover, officials in the health sector and the police were those most often requesting such extra-payments. It appears that important features of bribery have remained quite constant through the last decade".

In addition to the impact of demographic changes, i.e of an increase in the share of older people in society on the sustainability of the pension system in Bosnia and Herzegovina, another segment which will be affected by demographic changes in Bosnia and Herzegovina is the health system, that is, the financing of the health system in the period that is the subject of this analysis. The health system in Bosnia and Herzegovina is mostly financed from collected labour contributions.

The model projections of the number of workers and labour force in Bosnia and Herzegovina were previously presented, and they will largely determine the level of collected contributions for the financing of the health system in the country.

Based on available statistical data (Table 6), the share of public health expenditure increased from 1.54 billion BAM to 2.24 billion BAM over the period of 10 years (2009-2019), which ultimately represents an increase in the share of public health expenditure in total public expenditures from 14.4 percent to 16.8 percent. Although public expenditures grew in the same period, public health expenditure grew at a higher rate, which led to a higher share of health expenditure in total expenditures.

Table 6: Public health expenditure in billion BAM at current prices, 2009-2019

YEAR	PUBLIC EXPENDITURES	PUBLIC EXPENDITURES ON HEALTH	PUBLIC EXPENDITURES ON HEALTH/TOTAL PUBLIC EXPENDITURES (in %)
2009	10.66	1.54	14.4
2010	10.84	1.59	14.7
2011	10.91	1.68	15.4
2012	11.17	1.74	15.6
2013	10.94	1.79	16.3
2014	11.35	1.83	16.1
2015	11.59	1.89	16.3
2016	11.67	1.96	16.8
2017	11.91	1.98	16.6
2018	12.74	2.09	16.4
2019	13.33	2.24	16.8

Source: Created by author based on data of the BiH Central Bank and the BiH Agency for Statistics

If adjusted for inflation (Table 7, Fig. 45), nominal and real public health expenditure in this period have been almost identical, and there were no significant deviations resulting from increased consumer prices. However, when the given real public health expenditure is calculated per capita, it is possible to observe significant increase in the amount of health expenditures from 405 BAM in 2009 to 672 BAM in 2019, or an increase of 267 BAM (65.9 percent) due to a decrease in the number of inhabitants in Bosnia and Herzegovina over the given period.

Table 7: Per capita real health expenditures (adjusted for inflation), 2009-2019

YEAR	CURRENT PRICES	PRICES IN 2015	POPULATION	PER CAPITA REAL HEALTH EXPENDITURES
2009	1.54	1.51	3,735,945	405
2010	1.59	1.54	3,705,478	415
2011	1.68	1.68	3,661,173	459
2012	1.74	1.78	3,604,972	493
2013	1.79	1.82	3,542,598	514
2014	1.83	1.85	3,482,106	531
2015	1.89	1.89	3,429,362	552
2016	1.96	1.99	3,386,263	587
2017	1.98	1.99	3,351,534	594
2018	2.09	2.08	3,323,929	624
2019	2.24	2.22	3,300,998	672

Source: Created by author based on data of the BIH Agency for Statistics

In addition to public expenditure, in Bosnia and Herzegovina there is also a significant share of private health expenditure (Table 8), which accounts for 29.7 percent of total expenditure for health, which is more than the European Union average by 4.6 percent and by 7.4 percent that the spending in Germany.

Table 8: Private health expenditure as % of total health expenditure

COUNTRY	PRIVATE HEALTHCARE EXPENDITURE (AS % OF TOTAL HEALTH EXPENDITURE)
Bosnia and Herzegovina	29.7
Europe & Central Asia	27.0
Central Europe and the Baltics	26.0
Euro area	25.7
European Union	25.1
France	24.7
Germany	22.3
United Kingdom	20.5

Source: World Bank (accessed in August 2022) https://data.worldbank.org/indicator/ SH.XPD.PVTD.CH.ZS

Based on forecast and model projections of population trends in Bosnia and Herzegovina for the period 2022-2031 explained in first part of this report, as well as trends in gross domestic product[11], the level of real public expenditure for health is estimated to increase from 781.9 BAM in 2022 to 1,254.4 BAM in 2031, which is an increase of 472.5 BAM or 60.4 percent annually over the period of 10 years (Table 9).

The reasons for the increase in real public expenditure on health should be sought in the fact that in the period under review, 2022 - 2031, the total population in Bosnia and Herzegovina will significantly decrease, while the share of the population over 65, which represent the majority of beneficiaries of the healthcare system, will increase, and the ratio of labour force to the population over 65 will worsen.

In other words, the number of users of the health system will exponentially increase while the number of contributors to the health care fund will decrease, if no changes in the population structure and labour force occur in the coming years and if productivity of the health system remains at the same level.

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[11] *Based on quarterly data from 2000/Q1 to 2021/Q1, an average instantaneous quarterly GDP growth rate of 0.63 percent is calculated, which translates into an annualized compound GDP growth rate of 2.55 percent (see Annex 3 for details)*

Table 9: Projection of real public health expenditure, 2022-2037

YEAR	PER CAPITA PUBLIC HEALTH EXPENDITURE	HEALTH EXPENDITURE PER CAPITA GROWTH RATE	PUBLIC EXPENDITURE ON HEALTH / PUBLIC EXPENDITURE	GROWTH RATE OF HEALTH EXPENDITURE/ PUBLIC EXPENDITURE	PUBLIC EXPENDITURES / GDP	GROWTH RATE OF PUBLIC EXPENDITURE / GDP	POPULATION 65+ / POPULATION	GROWTH RATE OF POPULATION 65+ / POPULATION	LABOUR FORCE / POPULATION 65+	GROWTH RATE OF LABOUR FORCE / POPULATION 65+	GDP / EMPLOYMENT	GROWTH RATE OF GDP / EMPLOYMENT	EMPLOYMENT / WORKFORCE	GROWTH RATE OF EMPLOYMENT / LABOUR FORCE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2022	781.92		0.20		0.41		0.17		1.96		41,630.50		0.69	
2023	824.08	5.39	0.21	1.69	0.41	0.00	0.17	3.31	1.90	-2.89	42,243.30	1.47	0.70	1.96
2024	868.52	5.39	0.21	1.34	0.41	0.00	0.18	4.07	1.84	-3.27	42,865.10	1.47	0.72	1.96
2025	915.35	5.39	0.21	1.14	0.41	0.00	0.19	4.24	1.78	-3.24	43,496.10	1.47	0.73	1.96
2026	964.70	5.39	0.21	1.16	0.41	0.00	0.20	4.30	1.72	-3.32	44,136.30	1.47	0.75	1.96
2027	1,016.72	5.39	0.22	1.36	0.41	0.00	0.20	3.98	1.67	-3.21	44,786.00	1.47	0.76	1.96
2028	1,071.54	5.39	0.22	1.62	0.41	0.00	0.21	3.54	1.61	-3.05	45,445.20	1.47	0.78	1.96
2029	1,129.31	5.39	0.23	1.86	0.40	0.00	0.22	3.02	1.57	-2.79	46,114.20	1.47	0.79	1.96
2030	1,190.20	5.39	0.23	2.07	0.40	0.00	0.22	2.73	1.53	-2.71	46,792.90	1.47	0.81	1.96
2031	1,254.38	5.39	0.23	2.21	0.40	0.00	0.23	2.48	1.49	-2.60	47,481.70	1.47	0.82	1.96
AVERAGE GROWTH RATE		5.39		1.61		0.00		3.52		-3.01		1.47		1.96

Source: Created by author based on data of the BiH Central Bank and the BiH Agency for Statistics

The same model projections were made for public health expenditure per capita in Bosnia and Herzegovina in the period 2022-2031 using the 2015 prices. Table 10 shows model projections of the share of public health expenditure to total public expenditures, as well as the share of public health expenditure to the gross domestic product.

According to these data, the share of public health expenditure to total public expenditures will likely increase from 20.6 percent in 2022 to 24.2 percent in 2031, while the share of public health expenditure to the gross domestic product will likely increase from 7.6 percent to 8.6 percent, which is most credited to the higher total public expenditure on health, which according to model projections should increase from 2.65 to 3.78 billion BAM annually, according to the 2015 prices.

In other words, this means that significantly more collected taxes will have to be channelled into financing the health system in Bosnia and Herzegovina, which is a direct consequence of an increase in the number of older people aged 65+, while it will be a special challenge to secure additional financial resources, given the labour force reduction in Bosnia and Herzegovina.

When the population size is shrinking, there is no other way than to increase productivity as the key component of GDP growth rate. GDP growth rates must exceed 6-7 per cent per year over the longer term to build up fiscal capacity and generate enough fiscal resources to make the burden of growing total and particularly public expenditure on health services bearable (see Table 45).

Table 10: Public health expenditure in Bosnia and Herzegovina 2022-2031, at the 2015 prices

YEAR	PER CAPITA PUBLIC EXPENDITURE ON HEALTH	TOTAL PUBLIC EXPENDITURE ON HEALTHCARE (IN BILLION KM)	TOTAL PUBLIC EXPENDITURE (IN BILLION KM)	SHARE OF PUBLIC EXPENDITURE ON HEALTH IN TOTAL PUBLIC EXPENDITURE (%)	GDP (IN BILLION KM)	SHARE OF PUBLIC EXPENDITURE ON HEALTH IN GDP (in %)
2022	782.61	2.65	12.90	20.58	34.81	7.62
2023	823.43	2.76	13.17	20.97	35.70	7.74
2024	866.37	2.87	13.46	21.35	36.61	7.85
2025	911.56	2.99	13.75	21.74	37.55	7.96
2026	959.10	3.11	14.05	22.14	38.51	8.08
2027	1,009.12	3.24	14.35	22.54	39.49	8.19
2028	1,061.75	3.37	14.66	22.96	40.50	8.31
2029	1,117.12	3.50	14.98	23.37	41.53	8.43
2030	1,175.39	3.64	15.30	23.79	42.59	8.55
2031	1,236.69	3.78	15.63	24.21	43.68	8.66

Source: Created by author based on data of the BiH Agency for Statistics, the Public Health Institutes of the Federation of BiH and the Public Health Institute of the Republika Srpska

From the perspective of demographic changes and emigration of skilled professionals that have direct effect on the availability of medical professionals, the following analysis focused on the number of health workers in Bosnia and Herzegovina from 2009-2019.

Based on the data presented in Table 11, there was a significant increase in the ratio of the number of doctors per 10,000 inhabitants which means that the pool of medical professionals from which they are employed in public and/or private health institutions is still sufficient to cover for health needs of the overall population. The analysis did not, however, take into consideration the age and experience of medical workers and cannot elaborate on the quality of medical services but only the expenditures for overall medical services.

These data show that during the observed period, the number of doctors per 10,000 inhabitants increased from 17 to 23.1 between 2009 and 2019, which is a positive trend as it contributes to better coverage of population with health care services. Similar trends can be observed for other health workers, where their number increased from 31,071 to 32,958 in the same period, while the share of other health workers for every 10,000 inhabitants increased from 83.2 to 99.8.

In the end, the total number of health workers in the same period increased from 100.2 to 122 per 10,000 population. Although exact estimates of the departure of medical personnel from Bosnia and Herzegovina are not available, the trends in emigration of medical personnel have been proven and will likely lead to the deterioration of coverage and quality of services provided to citizens in Bosnia and Herzegovina, especially to older people whose numbers are on the increase.

Table 11: Healthcare workers in Bosnia and Herzegovina, 2009-2019

YEAR	DOCTORS	DOCTORS /10.000 CITIZENS	OTHER HEALTH CARE WORKERS	OTHER HEALTH CARE WORKERS /10.000 CITIZENS	HEALTH CARE WORKERS - TOTAL	HEALTH CARE WORKERS /10.000 CITIZENS
2009	6,369	17.0	31,071	83.2	37,440	100.2
2010	6,540	17.6	31,908	86.1	38,448	103.8
2011	6,729	18.4	32,167	87.9	38,896	106.2
2012	6,874	19.1	32,533	90.2	39,407	109.3
2013	6,708	18.9	32,857	92.7	39,565	111.7
2014	7,272	20.9	32,745	94.0	40,017	114.9
2015	7,255	21.2	32,522	94.8	39,777	116.0
2016	7,285	21.5	32,773	96.8	40,058	118.3
2017	7,330	21.9	32,436	96.8	39,766	118.7
2018	7,510	22.6	33,011	99.3	40,521	121.9
2019	7,702	23.1	32,958	99.8	40,660	122.0
AVERAGE GROWTH RATE	**1.8**	**3.1**	**0.4**	**1.8**	**0.7**	**2.0**

Source: Created by author based on data of the Public Health Institute of the Federation of BiH and the Public Health Institute of the Republika Srpska

If nothing changed in BiH i.e. if current trends persist – what is a realistic view since there are no health reforms on the horizon - the number of doctors per 10,000 inhabitants in 2031 would reach 31.1 what is approximately the 2020 level of density of UK (30.0), Serbia (31.1), France (32.7) or Slovenia (32.8). It would be useful to carry out benchmark efficiency analysis i.e. to compare the health systems of BiH and comparator countries (small European countries with the population size of 1 to 11 million of inhabitants) and to find out size of inputs (number of physicians, public expenditure levels) corresponding the satisfactory levels of outputs (health conditions of the population).

It is important to emphasize, as shown in Table 9, that the size of public health expenditure per capita is decisively influenced by the following factors:

- Medical factors (health expenditure to public expenditure)

- Ageing factors i.e. the old-age dependency ratio (the population over 65 to both the total population and to the labour force given in the formula below as the inverse of labour force to population), and

- Economic factors (the ratio of employment to labour force i.e. employment rate, the ratio of GDP to employment i.e. productivity rate - these two rates determine GDP growth - and the ratio of public expenditure to GDP)

The influence of the aforementioned factors could be measured by the following formula:[12]

$$\text{Per capita health expenditure} = \frac{\text{Population over 65}}{\text{Population}} \; x \; \frac{\text{Labour Force}}{\text{Population over 65}} \; x \; \frac{\text{Empl}}{\text{Labour Force}} \; x \; \frac{\text{Health Expend}}{\text{Public Expend}} \; x \; \frac{\text{Public Expend}}{\text{GDP}} \; x \; \frac{\text{GDP}}{\text{Empl}}$$

As the Table 9 shows, the most important determinants of health expenditure per capita are demographic factors i.e. the ratio of population over 65 to the labour force and to the total population.

A major problem with the health system in Bosnia and Herzegovina is the huge inefficiency resulting in the extensive debts accumulated by the health centres established by municipalities and hospitals established by entities and cantons. The key parts of these debts consist of arrears of unpaid wages, taxes and social security contributions of the employees of the health care institutions, and unpaid payments to private suppliers. The debt of the health care system was KM 438.7 million (2.0 percent of GDP) in the FBiH at the end of 2020, and KM 1,055 million (9.5 percent of GDP) in the RS as of 30 June 2021 (ILO, 2022)

Without further reforms, the health expenditures would increase by one percentage point of GDP and by 3.63 percentage points of total public expenditures between now and 2031. Declining population can reduce economic growth and—if not accompanied by a commensurate productivity growth—make it more difficult for Bosnia and Herzegovina to bear its health expenditures.

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[12] *For the logic behind the formula see Annex 3.*

EDUCATION SYSTEM IN BOSNIA AND HERZEGOVINA

The third segment within this research refers to the impact of demographic changes on the education sector in Bosnia and Herzegovina. In this part, the focus is on the number of pupils in elementary and secondary schools, and the number of students in public and private universities. Also, the number of teachers and professors was observed, which is important for assessing the impact of costs per pupil, student and teacher.

The Agency for Statistics of Bosnia and Herzegovina has been keeping the records of the number of pupils and students for Bosnia and Herzegovina since the school year 2010/2011. According to their data, including the latest published data for the 2021/2022 school year, the number of pupils and students is decreasing every year. In the mentioned period, the number of students in elementary schools decreased by 70,805 or 21.1 percent, in secondary schools by 43,353 or 28.6 percent, while the number of students decreased by 40,972 or 35.5 percent (Table 12, Fig. 42).

Table 12: Number of pupils and students, 2010-2021

NUMBER OF PUPILS AND STUDENTS	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
ELEMENTARY EDUCATION	335,403	316,657	304,881	302,133	296,819	291,342
SECONDARY EDUCATION	151,680	163,284	166,662	156,350	143,881	133,228
HIGHER EDUCATION	115,538	115,907	112,607	111,970	108,475	106,975
NUMBER OF PUPILS AND STUDENTS	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
ELEMENTARY EDUCATION	287,729	282,946	280,018	274,034	268,059	264,598
SECONDARY EDUCATION	126,824	124,148	117,475	112,796	110,404	108,327
HIGHER EDUCATION	102,232	95,142	89,016	82,909	82,744	74,566

Source: Created by author based on data of the BiH Agency for Statistics

Table 13: Model projections of pupils and students, 2022-2031

NUMBER OF PUPILS AND STUDENTS	2022/2023	2023/2024	2024/2025	2025/2026	2026/2027
ELEMENTARY EDUCATION	258,252	252,202	244,723	237,157	228,964
SECONDARY EDUCATION	106,319	105,854	106,062	105,988	105,272
HIGHER EDUCATION	69,675	65,839	62,836	60,645	59,189
NUMBER OF PUPILS AND STUDENTS	2027/2028	2028/2029	2029/2030	2030/2031	2031/2032
ELEMENTARY EDUCATION	220,814	214,119	209,791	206,289	201,794
SECONDARY EDUCATION	103,524	100,053	95,540	91,478	88,096
HIGHER EDUCATION	58,427	58,371	58,169	57,696	57,041

Source: Calculated by author

Based on the data presented in Table 12 (Fig. 42), as well as on the forecast and model projections of the number of inhabitants for every age, which is shown in the Annex, an assessment of the number of pupils and students was conducted for the period starting from the school year 2022/2023 to the school year 2031/2032.

Figure 42: Past and projected number of pupils and students in Bosnia and Herzegovina, 2010-2031
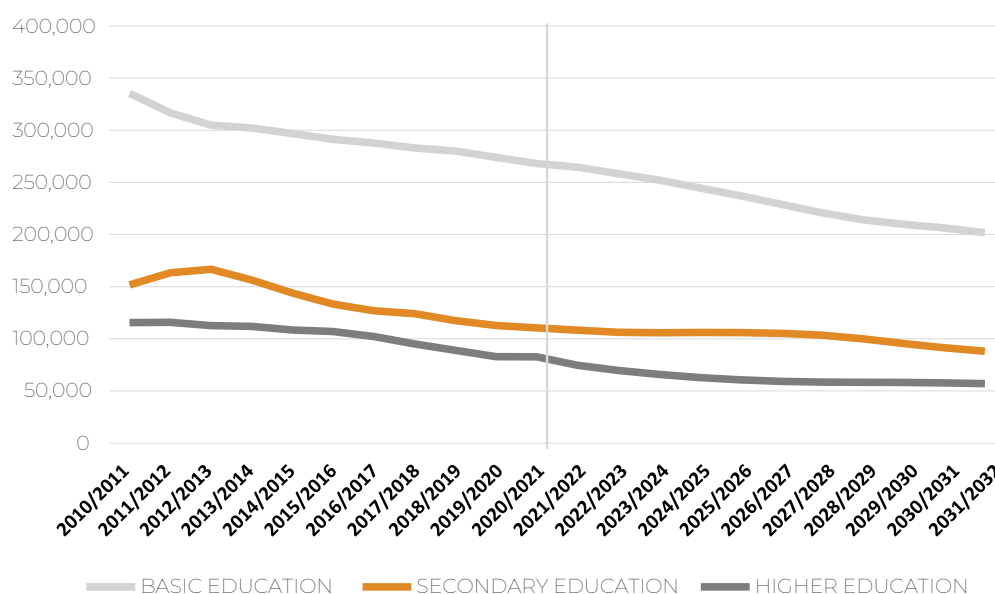
Source: Created and calculated by author based on data of the BiH Agency for Statistics

In the first case, when assessing the number of pupils in elementary schools, it was found that 86.8[13] percent of the population in Bosnia and Herzegovina in the age group 6-14 account for a number of students in elementary schools. Similarly, it was found that 76.5 percent of the population in the age group 15-18 account for the total number of secondary school pupils, while 37.7 percent of the population in the age group 19-23 account for the total number of students.

Based on past enrolment data and population forecast, future enrolment trends in elementary, secondary, and higher educational institutions were estimated. It is estimated that the number of pupils in elementary schools, between 2022 and 2031, will further decrease by 62,084 or 23.7 percent, those in secondary schools will decrease by 20,231 or 18.7 percent and, similarly, those in higher education will decrease by 17,525 or 20.3 percent (Table 13, Fig. 42).

Although such developments are largely expected due to projected population trends and expected reduction in the number of children in the country, very few steps are currently taken to reorganise educational sector in order to decrease expenditures on education or adjust curricula to better respond to the labour market requirements.

As a reminder, it is important to emphasize that according to the data of the Agency for Statistics of BiH for 2019, about 97.9 percent of expenditures on education refers to current costs, which mainly include the costs of salaries and allowances paid to teachers, while only 2.1 percent goes to capital expenditures.

Table 14: Annual expenditure on education, 2016-2019

EDUCATION EXPENDITURE (KM)	2016	2017	2018	2019
ELEMENTARY EDUCATION	675,675,031	661,876,240	683,662,903	746,368,000
SECONDARY EDUCATION	349,143,753	336,871,799	344,335,435	362,754,000
HIGHER EDUCATION	306,395,201	331,042,049	260,909,044	351,714,000
OTHER	81,624,178	77,842,365	69,855,756	90,142,000
TOTAL	**1,412,838,163**	**1,407,632,453**	**1,358,763,138**	**1,550,978,000**

Source: Created by author based on data of the BiH Agency for Statistics

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[13] *If compared with the World Bank data that state 99.9 percent school attendance, it might be concluded that official number of population is overestimated and real numbers are significantly lower. At the same time, it is well known that official population estimates do not take into consideration external migrations as there is no official migration statistics. Hence, if population data is corrected based on elementary school attendance data, it is probable that today's population in BiH is smaller by approximately 13 percent. However, for the sake of this analysis, it will be assumed that official population estimates are correct as well as population forecast and model projections calculated based on the latest population estimates.*

Table 15: Projected annual expenditure on education, 2020-2030

EDUCATION EXPENDITURE (KM)	2020	2021	2022	2023	2024	2025
ELEMENTARY EDUCATION	761,295,360	776,521,267	792,051,693	807,892,726	824,050,581	840,531,593
SECONDARY EDUCATION	370,009,080	377,409,262	384,957,447	392,656,596	400,509,728	408,519,922
HIGHER EDUCATION	355,231,140	358,783,451	362,371,286	365,994,999	369,654,949	373,351,498
OTHER	91,944,840	93,783,737	95,659,412	97,572,600	99,524,052	101,514,533
TOTAL	**1,581,997,560**	**1,613,637,511**	**1,645,910,261**	**1,678,828,467**	**1,712,405,036**	**1,746,653,137**

EDUCATION EXPENDITURE (KM)	2026	2027	2028	2029	2030
ELEMENTARY EDUCATION	857,342,224	874,489,069	891,978,850	909,818,427	928,014,796
SECONDARY EDUCATION	416,690,321	425,024,127	433,524,610	442,195,102	451,039,004
HIGHER EDUCATION	377,085,013	380,855,863	384,664,422	388,511,066	392,396,177
OTHER	103,544,823	105,615,720	107,728,034	109,882,595	112,080,247
TOTAL	**1,781,586,199**	**1,817,217,923**	**1,853,562,282**	**1,890,633,528**	**1,928,446,198**

Source: Calculated by author

In addition to the model projections of the number of pupils and students until the school year 2031/2032, a projection of the trend in annual expenditure for education for elementary, secondary and higher education was made, as well as model projections of annual expenditure per pupil/student.

In Table 14 (Fig. 43), the current annual expenditure on education according to the type of education for the period 2016-2019[14,15,16,17] is shown, which is also the most recent official published data of the BiH Agency for Statistics. Based on the above data, it can be seen that expenditure on education was growing for all three types of education, with highest increase for elementary education (10.5 percent) and higher education (14.8 percent) between 2016 and 2019.

[14] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2018/EDU_06_2016_Y1_0_BS.pdf*

[15] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2019/EDU_06_2017_Y1_0_BS.pdf*

[16] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2020/EDU_06_2018_Y1_0_BS.pdf*

[17] *https://bhas.gov.ba/data/Publikacije/Saopstenja/2021/EDU_06_2019_Y1_1_BS.pdf*

Figure 43: Past and projected annual expenditure on education per type of education, 2016-2030
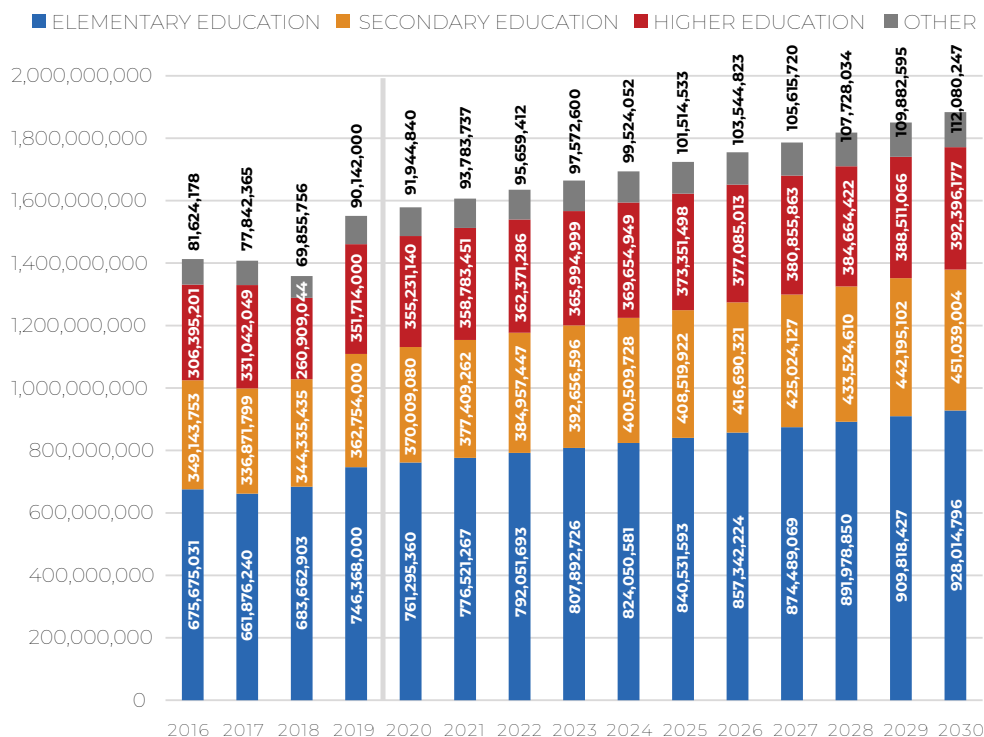
Source: Created and calculated by author based on data of the BiH Agency for Statistics

Given the long-time negative trend in the number of children in the country, and the afore-mentioned structure of educational expenditures, it could be assumed that such increase is based on the increased salaries of educational professionals rather than improved quality of education through the provision of modern teaching equipment.

The difficulty in making estimates of expenditure in education for the future period is represented by a very modest time series, which includes only four years and where it is not possible to determine a clear pattern of the percentage-wise trend for expenditures within individual categories. However, an assumption is made that annual expenditure on elementary and secondary education will grow at a rate of 2 percent, while annual expenditure for higher education will grow at a rate of 1 percent.

Based on these assumptions (Table 15), the total annual expenditure on education will likely grow from 1.55 billion in 2019 to 1.93 billion in 2030, which represents an increase of 377.5 million BAM or 24.3 percent. The assessment was taken very conservatively, considering the unknowns regarding the changing numbers of teachers and professors in the future period.

Table 16: Annual expenditure on education per pupil/student, 2016-2019

ANNUAL EDUCATION COST PER PUPIL AND STUDENT (BAM)	2016	2017	2018	2019
ELEMENTARY EDUCATION	2,348	2,339	2,441	2,724
SECONDARY EDUCATION	2,753	2,713	2,931	3,216
HIGHER EDUCATION	2,997	3,479	2,931	4,242

Source: Created by author based on data of the BiH Agency for Statistics

Table 17: Projected annual expenditure on education per pupil and student

ANNUAL EDUCATION COST PER PUPIL AND STUDENT (BAM)	2020	2021	2022	2023	2024	2025
ELEMENTARY EDUCATION	2,840	2,935	3,067	3,203	3,367	3,544
SECONDARY EDUCATION	3,351	3,484	3,621	3,709	3,776	3,854
HIGHER EDUCATION	4,293	4,812	5,201	5,559	5,883	6,156
ANNUAL EDUCATION COST PER PUPIL AND STUDENT (BAM)	**2026**	**2027**	**2028**	**2029**	**2030**	
ELEMENTARY EDUCATION	3,744	3,960	4,166	4,337	4,499	
SECONDARY EDUCATION	3,958	4,106	4,333	4,628	4,931	
HIGHER EDUCATION	6,371	6,518	6,590	6,679	6,801	

Source: Calculated by author

In line with the increase of annual education expenditures in the times of population decrease, a parallel analysis of total expenditures per pupil/student was made (Table 16, Fig. 44). It could be concluded that the annual expenditures per pupil/student increased in the period 2016-2019, which is a consequence of a slight increase in expenditures and a decrease in the number of pupils and students, which is especially pronounced in terms of the number of students. In this period, expenditures per elementary school pupil increased from 2,348 BAM to 2,724 BAM or by 16 percent, then per secondary school student from 2,753 BAM to 3,216 BAM or by 16.8 percent, and expenditures per university student from 2,997 BAM to 4,242 BAM or by 41.5 percent.

Figure 44: Past and projected annual expenditure on education per pupil/student, 2016-2030

■ ELEMENTARY EDUCATION ■ SECONDARY EDUCATION ■ HIGHER EDUCATION
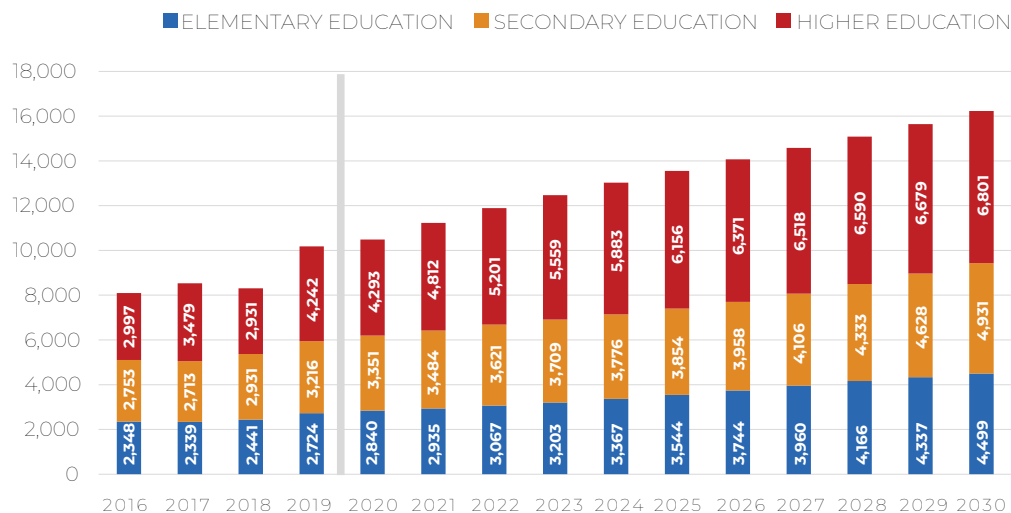
Source: Created and calculated by author based on data of the BiH Agency for Statistics

Model projections of the increase of annual education expenditures per pupil/ student for the period 2020-2030 were made based on the previous assumptions of the increase in education expenditures, and model projections of the number of pupils and students. According to the model projections for the period up to 2030 (Table 17, Fig. 44), it is estimated that annual expenditures per elementary school pupil will increase from 2,840 BAM in 2020 to 4,499 BAM in 2030 or by 58,4 percent, expenditures per secondary school students from 3,351 BAM to 4,931 BAM or by 47.1 percent, and expenditures per university student from 4,293 BAM to 6,801 BAM or by 58.4 percent. These model projections show that even with minimal annual increase of education expenditures and a decline in the number of pupils and students, there will be a significant increase in expenditures per pupil and student.

Finally, based on the data on the number of teachers and professors (Table 18) and overall annual education expenditures presented earlier in this report, education expenditures per teacher/professor were observed for the period 2016-2019 (Table 19). In this period, expenditures per teacher/professor increased for all types of education. Expenditure per elementary school teacher increased from 28,029 BAM to 31,127 BAM or by 11.1 percent; expenditure per secondary school teacher increased from 27,332 BAM to 28,811 BAM or by 5.4 percent, and expenditure per higher education professor increased from 31,979 BAM to 34,652 BAM or by 8.4 percent. This increase can be explained by further increase in expenditure for financing salaries of educational professional as the total number of teachers and professors increased by only 0.5 percent between 2016 and 2019, in comparison to the increase in the cost of living that was significantly higher in the same period.

Table 18: Number of teachers and professors working in educational institutions, 2016-2019

NUMBER OF PROFESSORS	2016	2017	2018	2019
ELEMENTARY EDUCATION	24,106	23,515	23,824	23,978
SECONDARY EDUCATION	12,774	12,859	12,652	12,591
HIGHER EDUCATION	9,581	9,526	10,028	10,150

Source: Created by author based on data of the BiH Agency for Statistics

Table 19: Annual expenditure on education per teacher/professor, 2016-2019

ANNUAL EDUCATION COST PER PROFESSOR (BAM)	2016	2017	2018	2019
ELEMENTARY EDUCATION	28,029	28,147	28,696	31,127
SECONDARY EDUCATION	27,332	26,197	27,216	28,811
HIGHER EDUCATION	31,979	34,751	26,018	34,652

Source: Created by author based on data of the BiH Agency for Statistics

If the ratio of pupils to teachers in elementary and secondary schools and higher education institutions from 2016 was applied to the model projections of the number of pupils and students until 2031, while retaining 10 percent of the teaching staff as a reserve, then in 2031 the number of teachers in elementary schools should decrease by 5,203 or 21.9 percent, the number of teachers in secondary schools should decrease by 2,019 or 17.1 percent, and the number of professors at higher education institutions should decrease by 1,302 or 18.1 percent, which is a total decrease of 8,525 teachers and professors. Increasing the educational annual cost in combination with a reduction in the number of teachers and professors should be used to increase the living standard of those teachers and professors and to increase the productivity and efficiency of the educational system which can boost and improve the quality through new equipment.

CONCLUSIONS

From the perspective of past population data and population forecast and model projections conducted within this initiative, it could be concluded that the overall fertility in the country will continue to display low values belonging to the zone labelled in demography as lowest-low fertility with values rather oscillating than showing any significant change.

This situation partially reflects the relatively dynamic postponement of parenthood, resulting in the so-called fertility ageing. Ageing of fertility has probably not yet reached its peak at the forecast threshold, but the mean age of mothers at birth is already relatively high and should stop or significantly slow down soon. Therefore, it is assumed that the decrease or even stagnation of the overall fertility will finish, and a very moderate long-term increase is expected.

Mortality intensity decreased during the past twenty years until the outbreak of COVID-19 pandemic when a dramatic increase in mortality was observed in 2020 and in 2021. Expressed in a pronounced drop in life expectancy, the pandemic will, however, likely be a sudden episode in the long-term mortality developments. Compensation for this profound decline will probably be a short- or medium-term process lasting between two and eight years, depending on the scale and structure of the secondary consequences of COVID-19 on population health. Afterwards, the decrease in mortality should continue in line with the pre-COVID-19 trends, and the average length of life of women and men should grow accordingly. This life expectancy growth at birth should remain significant but, at the same time, should slowly lose its dynamics.

The volume of international migrations will very probably decrease due to the decline in population size and ageing, in particular because of less and less numerous younger cohorts – the core of potential migrants. The demographic impact of migration, which is currently more significant than the influence of natural change, at least in terms of the development of total population size, will undoubtedly wane. The reason is not only the mentioned successive reduction of migration volumes but also significantly increasing deficit of natural change (the excess of deaths compared to births). In sum, migration will probably remain in the position of the most significant component only during the first several years of the forecast period. Sooner or later, the natural change balance should outnumber migration balance and become the leading component of the reproduction.

Considering these findings and population forecast, it is evident that the most likely changes in the size and age-sex structure of the population of Bosnia and Herzegovina will have far-reaching consequences affecting virtually every aspect of society's life. The most affected by these changes will undoubtedly be the

essential areas of public interest – public finance, social security and assistance, public health system, education, and labour market. Moreover, the impacts of demographic development on these sectors are interconnected. Usually, the situation in one area significantly influences the condition in others and vice versa.

Rapid population ageing is raising the question of the entire pension system's sustainability. It will be one of the critical issues to settle within the context of assumed population development. A more than doubled proportion of older population within the next three decades and its further increase in the following years and more frequent survival to high ages will also result in a very high rise in demand for health care and social protection services. The combination of these two factors will exert exponential pressure on the growth of public health expenditures, change the internal age-sex structure of pensioners, the size structure of households and families and the volume and structure of their spending.

The productive age population representing the potential labour force will, beyond any doubt, rapidly decline and age simultaneously during the entire forecast period. These changes will weaken the demand for jobs but also the labour potential of the population, thus raising public concerns over the future population development of Bosnia and Herzegovina.

Table 20: Projected change in the number of the main categories of the population in BiH, 2022-2031

YEAR	PENSIONERS	TOTAL POPULATION	WORKING AGE POPULATION	POPULATION 65+	EMPLOYEES	LABOUR FORCE
2022	711,431	3,390,529	2,304,563	618,917	836,245	1,205,918
2023	721,524	3,354,811	2,265,031	631,733	845,152	1,195,336
2024	731,761	3,316,034	2,220,476	647,350	854,154	1,184,848
2025	742,142	3,278,617	2,177,205	663,150	863,252	1,174,451
2026	752,671	3,242,159	2,133,725	679,886	872,447	1,164,146
2027	763,349	3,205,851	2,090,592	696,267	881,740	1,153,931
2028	774,178	3,169,537	2,047,270	711,875	891,132	1,143,806
2029	785,162	3,133,107	2,003,884	725,859	900,624	1,133,770
2030	796,301	3,096,445	1,960,704	739,498	910,216	1,123,822
2031	807,598	3,059,401	1,918,390	752,608	919,912	1,113,961
DIFFERENCE	**96,167**	**-331,128**	**-386,173**	**133,691**	**83,667**	**-91,957**
2031/2021 (u %)	**13.5**	**-9.8**	**-16.8**	**21.6**	**10.01**	**-7.6**

Source: Calculated by author based on data of the BiH Agency for Statistics, the BiH Agency for Labour and Employment, the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

Based on the population forecast and model projections presented in the report, it can be concluded that in the next 10-year period (2022-2031), the following changes could be expected (Table 20):

- Reduction of the overall population by 331,000 or by 9.8 percent;
- Decrease in the working-age population by 386,000 or by 16.8 percent;
- Increase in the older population (65+) by 134,000 or by 21.6 percent;
- Reduction of the workforce by 92,000 or by 7.6 percent, and an equivalent increase in the number of pensioners and,
- Increase in the number of employees by 84,000 or by 10.0 percent.

The demographic category that will see the largest decrease, both in absolute and relative terms, is the working-age population. On the other hand, the category that will see the largest increase is the population over 65.

Although the model projections show that the number of employees in Bosnia and Herzegovina will increase in the coming period, the level of the workforce will be decreasing, which will mean that the number of employees will be significantly closer to the number of the workforce. The availability of new workers on the labour market will largely depend on the way and possibility of activating the persons who are outside the labour force, primarily the female population, which accounts for almost two thirds of the total number of inactive persons.

An additional way to increase the number of employed persons and the labour force will depend on the liberalization of labour import from other countries (e.g. through immigration programmes to attract the whole families to relocate to Bosnia and Herzegovina, the same way families from Bosnia and Herzegovina have been leaving to other, more developed countries).

Expenditures on pensions will be increasing significantly in the coming period, but this will not be accompanied by a significant increase in the per capita amount of pensions due to a greater increase in the number of beneficiaries of an old-age pension, which will likely mean that the standard of living of pensioners will not be significantly improved. An average pension will probably remain at around 40 percent of an average real salary. With the transition of the pension system to treasury operations, the pressure on the method of financing pensions through contributions was reduced, but their importance is still enormous in the current and future periods.

Similarly to the financing of the pension system, expenditures on the health system will also increase in relation to the total public expenditures, as well as in relation to the level of the gross domestic product, which is a consequence of the increase in the number of older population. Because of this, it can hardly be expected that the quality of public health services will increase but rather

more population will compete for the same level of services, hence decreasing the coverage and quality of the health care. A special challenge will be the availability of health personnel and the impact of emigration on the number of doctors who would be providing healthcare services to residents.

Demographic trends will continue to have a negative impact on the education system as well, through a reduction in the number of pupils and students, along with an expected increase in education expenditure. This increase will lead to higher expenditures per teacher and professor, where it is challenging to measure the level of productivity. A reduction in the number of pupils and students will inevitably lead to reduced demand for teaching staff, if the current ratio and the standard of the number of pupils and students per teacher/professor remain the same.

Given that most of the expenditure on education goes for financing salaries of teaching professionals, it is highly unlikely under current trends that the quality of education will improve due to outdated teaching curricula not aligned with the labour market needs. Improving the quality of human capital in the country and consecutively improving the per capita productivity require investments in modern teaching tools and equipment, as well as development of modern teaching curricula, for which additional funding would be needed on top of already significant expenditure on education.

Finally, although there is a statistical system in the country supported by administrative data from many relevant institutions, data on population and expenditures on education, health care and pensions remain insufficient and not adequately disaggregated to enable continuous monitoring of such trends and designing adequate measures to prevent negative effects of population changes.

Only practical and efficient policy measures based on evidence-based sectoral policies can bring the expected results. In this context, it is important to emphasise that the regular censuses of population and continuous population forecast and model projections should play a core role in the design, monitoring and adjustments of such policies. At the same time, relevant government institutions working on education, health care, and social protection should develop adequate methodology and systems for contributing to policy development and monitoring within their scope of work.

RECOMMENDATIONS

Considering estimated demographic trends and their impact on the socio-economic development of Bosnia and Herzegovina, it is of utmost importance to revise existing development policies and strategies at all levels in the country and incorporate population analysis and population measures in every aspect of human development.

To do this, it is essential to improve existing systems for statistical and administrative data collection, engage in regular data collection and dissemination of disaggregated data as well as data analysis. Given that statistical institutions in the country have responsibility only for data collection and data dissemination, it is obvious that inclusion of the academic community and establishing of research institutes is mandatory for data to be understood and applicable for policy and strategy development.

When it comes to population data, it is essential to regularly conduct population censuses as they represent the only way to know how many people live in the country and what public services they require. Although many countries have transitioned to conducting register-based censuses in order to reduce their costs, this is not possible in Bosnia and Herzegovina as there is no system for monitoring migrations. Hence, development of such system should be also prioritised by relevant government institutions.

Furthermore, government authorities need to work on strengthening human capital in the country and respectively increase per capita productivity in all sectors of development. Given the projected decrease of overall population in Bosnia and Herzegovina, the only way to compensate for population loses is to produce more at the same level of investment or inputs.

Human capital could be strengthened in numerous ways, from improving formal and non-formal education, to organising upskilling and reskilling for those already in employment, to developing policies that will enable adequate balance between work and personal time. Scandinavian countries could be studied to better understand the changes needed in educational sector or family friendly policies that all contribute to increasing the quality of overall population. Besides human development, it is necessary to invest greater financial resources in research and development and innovation (automation and robotics), with the aim of increasing the level of worker productivity, creating greater gross added value, and improving efficiency, speed, quality and performance. Investments in automation and robotics could be significant so adequate and timely planning is important.

Number of professionals working in the education sector will need to be carefully monitored and eventually reduced to reflect the reduction in the number of

pupils and students, while any savings should be used for reskilling of education professionals to better match for new skills and trends in the labour market, and for the provision of modern teaching equipment for practical teaching and learning of new skills. The same approach should be taken in the health care sector where the number of professionals is currently sufficient, but due to emigration of skilled professionals there will be a need to compensate for losses of health care professionals either through education and training of new generations or immigration of health care professionals from other countries.

In the labour market, it is necessary to develop adequate measures that would activate population that is currently neither looking for employment nor is engaged in education. Proportion of such population is large (according to the Labour Force Survey, over half a million people are inactive). Given that women represent the majority of inactive population, such measures largely need to take into consideration their needs from the provision of childcare and care services for ever ageing population, to educational programmes that are aligned with other, non-paid responsibilities of women such as taking care of households etc. If women are to be engaged and contribute to socio-economic development, men will need to engage more in household chores and take part of the burden of care for children, older persons and households. Furthermore, existing gender pay gap will have to be reduced as currently women are less paid than men for the same level of job and responsibility while the proportion of cost of institutional childcare remains high in women's income, hence keeping women out of the labour market.

Other stimulating measures should be developed making activation in the labour market more desirable such as providing free childcare or adjusting working hours of childcare institutions for better alignment with working hours of parents. According to UNICEF, pre-school coverage in the country at under 20% is significantly lower than in other developed countries where it reaches as many as 80-90 percent of young children. Hence, investments in establishing new pre-school institutions or expanding the size of existing pre-school institutions will be essential. In order to reach the pre-school education coverage like in the more developed countries, this will certainly require significant financial investments and time, not to mention the lack of educated professionals for caring for young children.

Regarding pensions and health care, given the expected significant increase in the number of older persons in the country, major focus should be on increasing productivity as afore mentioned. With higher productivity, labour contributions for pensions and health care should be increased as well, hence contributing to increasing pensions and reducing the gap between the average pension and average salary. This is important in order to improve the living conditions of older persons and keep them active and healthy as the population with smaller

healthy life expectancy will require even more investments in the provision of health care and social protection. Furthermore, measures for extending the retirement age as applied by many developed countries need to be taken into consideration. Although not popular, such measures could temporarily offset for the lack of budgets for pensions. However, in the long run, strengthening human capital and increasing productivity gives more stable and sustainable solution to covering the needs of older persons. This is especially important as a significant number of older persons will not have any income in older age (those not in retirement for various reasons) and their care will require significant funding no matter of the number of pensioners.

In the meantime, until the above measures start giving results, governments need to take into consideration development of immigration programmes to offset for changes in population size and structure. Current trend of issuing work permits is only of temporary character as workers return to their countries of origin upon the end of employment. In order to provide sustainability to the labour market, it is necessary to learn from more developed countries to which the BiH population emigrates and where living conditions for the whole families are provided ensuring their long-term stay and contribution to socio-economic development of the receiving countries. Given high investments in education and health care of own population before emigration, it is necessary to compensate for these losses by attracting skilled workers and their families from other countries and ensuring their long-term stay in Bosnia and Herzegovina (employment for adults and education for their children).

Finally, reforms of the tax system should be introduced to decrease tax burden on employers and increase workers' salaries and wages. This would further stimulate the reduction of grey market, enable employment of unemployed and inactive persons, and increase government budgets that could be used for financing other public services from education to health care and to social protection with focus on those most vulnerable that cannot participate in the labour market.

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ANNEX 1 – CALCULATION OF MODEL PROJECTIONS FOR EXPENDITURES IN PENSION, HEALTH, AND EDUCATION SECTORS

In the preparation of this analysis, various methods of scientific research work were used, which were necessary for the preparation of model projections of the movement of various indicators. Since these are statistical analyses, which in their integral form are not necessary to be found in the text of the analysis, they are therefore an integral part of this annex.

Based on the regression analysis, as shown in Table 21 and Table 22 below, average quarterly employment growth rates of 0.08829 percent were calculated, which corresponds to an annual growth rate of 1.07 percent. Based on these calculations, it was possible to create a projection of employment trends for the period 2022-2031.

Table 21: Descriptive employment statistics in BiH, 2017-2022

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	55	2,019,636	1,379	2,017	2,022
Month	55	6,364	3,582	1	12
Employment	55	815,664	18,186,855	753,202	844,792
Time variable	55	722	16,021	695	749
Trend	55	28	16,021	1	55

Source: Created by author based on data of the BiH Agency for Statistics

Table 22: Calculation of an average growth rate of employment in BiH, 2017-2022

Ln (employment)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
time	.001	0	30,437	0	.001	.001	***
Constant	13,587	.005	2787.49	0	13,577	13,597	***
Mean dependent var		13,612		SD dependent var		0.023	
R-squared		0		Number of obs		55,000	
F-test		33,994		Prob > F		0.000	
Akaike crit. (AIC)		-284,922		Bayesian crit. (BIC)		-280,907	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data of the BiH Agency for Statistics

To determine the labour force projection for Bosnia and Herzegovina, a regression analysis was conducted on the basis of the trends in the number of employed and unemployed workers for the period December 2017-May 2022, which includes a total of 55 monthly values.

Based on the regression analysis, as shown in Table 23 and Table 24 below, an average rate of decrease in labour force growth of -0.07344 percent per month, or an annual continuous rate of decrease of -0.8855, was calculated.

Table 23: Descriptive labour force statistics for BiH, 2017-2022

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	55	2,019,636	1,379	2,017	2,022
Month	55	6,364	3,582	1	12
Labour Force	55	1,231,528	16,401,284	1,205,303	1,266,484
Time	55	721	16,021	694	748
Time Trend	55	28	16,021	1	55
Log (Labour Force)	55	14,024	.013	14,002	14,052
Lag. Labour Force	54	14,024	.013	14,005	14,052

Source: Created by author based on data of the BiH Agency for Statistics and the BiH Agency for Labour and Employment

Table 24: Calculation of an average labour force rate in BiH, 2017-2022

Ln (labor force)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
time	-.0007344	0	-13.91	0	-.001	-.001	***
Constant	14,044	.002	8263.81	0	14,041	14,048	***
Mean dependent var		14,024		SD dependent var		0.013	
R-squared		0.785		Number of obs		55,000	
F-test		193,477		Prob > F		0.000	
Akaike crit. (AIC)		-400,821		Bayesian crit. (BIC)		-396,806	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data of the BiH Agency for Statistics and the BiH Agency for Labour and Employment

Based on the time series of the number of pensioners, which is available from January 2014 to December 2021, descriptive statistics was produced, which served to calculate the growth in the number of pensioners.

According to this analysis, the number of pensioners grew at an average monthly rate of 0.11739 percent or at an annual continuous rate of 1.0145 percent, as shown in Table 25 and table 26 below.

Table 25: Descriptive statistics for the number of pensioners and expenditure on pensions in BiH, 2014-2021

Variable	Obs	Mean	Std. Dev.	Min	Max
Public expenditure, current prices	13	44,632	1,387	10,665	14,794
Public expenditure, prices in 2015	13	11,854	1,096	10,453	14,176
Year	13	2,015	3,894	2,009	2,021
Ln (public expenditure, prices in 2015)	13	2,469	.09	2,347	2,652
Time trend	13	7	3,894	1	13

Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

Table 26: Calculation of the number of pensioners growth rate for BiH, 2014-2021

Ln (pensioners)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
time	.001	0	48.37	0	.001	.001	***
Constant	13,355	.001	9799.91	0	13,352	13,357	***
Mean dependent var		13,412		SD dependent var		0.033	
R-squared		0.962		Number of obs		95,000	
F-test		2,339,844		Prob > F		0.000	
Akaike crit. (AIC)		-685,645		Bayesian crit. (BIC)		-680,537	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

Based on the time series of average pensions available from January 2014 to December 2021, descriptive statistics was produced, which was used to calculate the average real pension growth rate. According to this analysis, an average real pension grew at a monthly rate of 0.17 percent, or at an average annual continuous rate of 2.11 percent, as shown in Table 27 and Table 28 below.

Table 27: Descriptive statistics of the average real pension growth rate for BiH, 2014-2021

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	96	2017.5	2.30	2014	2021
Month	96	6.5	3.5	1	12
Average pension	96	372.3	22	350.5	487.1
Time	96	695.5	27,857	648	743
Time trend	96	48.5	27,857	1	96
Ln (average pension)	96	5,918	.056	5,859	6,189

Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

Table 28: Calculation of the average real pension growth rate for BiH, 2014-2021

Ln (real average pension)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
time	.0017402	0	16.35	0	.002	.002	***
Constant	5,834	.006	981.16	0	5,822	5,847	***
Mean dependent var		5,918		SD dependent var		0.056	
R-squared		0.740		Number of obs		96,000	
F-test		267,270		Prob > F		0.000	
Akaike crit. (AIC)		-406,013		Bayesian crit. (BIC)		-400,884	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data of the Pension and Disability Insurance Fund of the Federation of BiH and the Pension and Disability Insurance Fund of the Republika Srpska

Table 29: Decomposition of the average real pension growth rate/ per capita real gross domestic product

1 YEAR	2 AVERAGE PENSION / GDP p.c.	3 GROWTH RATE AVERAGE PENSION / GDP p.c	4 AVERAGE PENSION / AVERAGE SALARY	5 GROWTH RATE AVERAGE PENSION / AVERAGE SALARY	6 AVERAGE NET SALARY / PER CAPITA GDP	7 GROWTH RATE AVERAGE NET WAGE / GDP p.c.	8 PENSIONERS / EMPLOYED	9 GROWTH RATE PENSIONERS / EMPLOYED	10 EMPLOYMENT / WORKFORCE	11 GROWTH RATE EMPLOYMENT/ LABOUR FORCE	12 WORKFORCE / PENSIONERS	13 GROWTH RATE OF LABOUR FORCE / PENSIONERS
2022	0.04		0.42		0.09		0.85		0.69		1.70	-2.26
2023	0.04	-1.48	0.43	0.37	0.09	-1.85	0.85	0.35	0.70	1.96	1.66	-2.26
2024	0.04	-1.58	0.43	0.37	0.09	-1.95	0.86	0.35	0.72	1.92	1.63	-2.26
2025	0.04	-1.56	0.43	0.37	0.09	-1.92	0.86	0.35	0.73	1.92	1.59	-2.26
2026	0.04	-1.54	0.43	0.37	0.09	-1.90	0.86	0.35	0.75	1.92	1.55	-2.26
2027	0.04	-1.55	0.43	0.37	0.09	-1.91	0.87	0.35	0.76	1.92	1.52	-2.26
2028	0.04	-1.56	0.43	0.37	0.08	-1.93	0.87	0.35	0.78	1.92	1.48	-2.26
2029	0.04	-1.58	0.44	0.37	0.08	-1.94	0.87	0.35	0.79	1.92	1.45	-2.26
2030	0.04	-1.60	0.44	0.37	0.08	-1.96	0.87	0.35	0.81	1.92	1.42	-2.26
2031	0.03	-1.62	0.44	0.37	0.08	-1.99	0.88	0.35	0.82	1.92	1.39	-2.26
AVERAGE GROWTH RATE		**-1.56**		**0.37**		**-1.93**		**0.35**		**1.93**		**-2.26**

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On the basis of the data on public health expenditures, it is possible to calculate real public expenditures on health services, as well as real health expenditures per capita.

Based on the aforementioned time series for the period 2009-2019, descriptive statistics of real public health expenditures per capita was produced, as shown in Table 30 below.

Table 30: Real public health expenditure per capita in the period 2022-2031 at the 2015 prices

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	11	2,014	3,317	2,009	2,019
Real public health expenditure pc	11	531.7	80,445	398,169	667,948
Time Trend	11	6	3,317	1	11
Ln (rhe pc)	11	6,265	.156	5,987	6,504

Source: Created by author based on data of the BiH Agency for Statistics

Figure 45: Nominal and real public expenditure and health expenditure per capita in Bosnia and Herzegovina, in billion BAM, 2009-2019
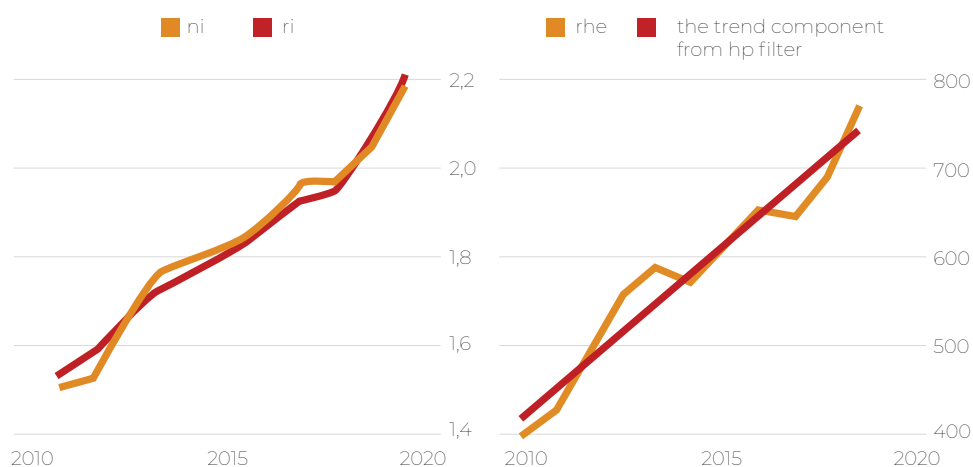
Source: Created by author based on data of the BiH Agency for Statistics

Descriptive statistics of total public expenditures for Bosnia and Herzegovina was compiled for the period 2009-2021, on the basis of which the model projections of trends in public health expenditures for the period 2022-2031 were calculated.

These data, as shown in Tables 31 and 32 below, show that total public expenditures at the 2015 prices grew at an average annual rate of 2.16 percent.

Table 31: Descriptive statistics of total public expenditures in BiH, 2014-2021

Variable	Obs	Mean	Std. Dev.	Min	Max
Public expenditure, current prices	13	44,632	1,387	10,665	14,794
Public expenditure, prices in 2015	13	11,854	1,096	10,453	14,176
Year	13	2,015	3,894	2,009	2,021
Ln (public expenditure, prices in 2015)	13	2,469	.09	2,347	2,652
Time trend	13	7	3,894	1	13

Source: Created by author based on data of the BiH Central Bank

Table 32: Calculation of total public expenditures in BiH, 2014-2021

Ln (public expenditure, prices in 2015)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
time	.022	.003	8.28	0	.016	.027	***
Constant	2,318	.021	112.10	0	2,272	2,363	***
Mean dependent var		2,469		SD dependent var		0.090	
R-squared		0.862		Number of obs		13,000	
F-test		68,485		Prob > F		0.000	
Akaike crit. (AIC)		-48,335		Bayesian crit. (BIC)		-47,205	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data of the BiH Central Bank

Table 33: Model projection of public health expenditure per capita in Bosnia and Herzegovina in the period 2022-2031 at the 2015 prices

YEAR	PUBLIC EXPENDITURE ON HEALTH PC	GROWTH RATE OF PER CAPITA HEALTH EXPENDITURE	PUBLIC EXPENDITURE ON HEALTH / PUBLIC EXPENDITURE	GROWTH RATE OF HEALTH EXPENDITURE/ PUBLIC EXPENDITURE	PUBLIC EXPENDITURES / GDP	GROWTH RATE OF PUBLIC EXPENDITURE / GDP	POPULATION 65+ / POPULATION	GROWTH RATE OF POPULATION 65+ / POPULATION	LABOUR FORCE / POPULATION 65+	LABOUR FORCE GROWTH RATE / POPULATION 65+	GDP / EMPLOYED	GROWTH RATE GDP / EMPLOYED	EMPLOYEES / WORKFORCE	GROWTH RATE EMPLOYEE / LABOUR FORCE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2022	783.00		0.21		0.37		0.18		1.96		41,630.00		0.69	
2023	823.00	5.22	0.21	1.91	0.37	-0.38	0.19	3.16	1.90	-2.89	42,243.00	1.47	0.70	1.96
2024	866.00	5.22	0.21	1.80	0.37	-0.38	0.20	3.67	1.84	-3.27	42,865.00	1.47	0.72	1.96
2025	912.00	5.22	0.22	1.83	0.37	-0.38	0.20	3.61	1.78	-3.24	43,496.00	1.47	0.73	1.96
2026	959.00	5.22	0.22	1.85	0.36	-0.38	0.21	3.68	1.72	-3.32	44,136.00	1.47	0.75	1.96
2027	1,009.00	5.22	0.23	1.84	0.36	-0.38	0.22	3.57	1.67	-3.21	44,786.00	1.47	0.76	1.96
2028	1,062.00	5.22	0.23	1.82	0.36	-0.38	0.22	3.41	1.61	-3.05	45,445.00	1.47	0.78	1.96
2029	1,117.00	5.22	0.23	1.81	0.36	-0.38	0.23	3.15	1.57	-2.79	46,114.00	1.47	0.79	1.96
2030	1,175.00	5.22	0.24	1.79	0.36	-0.38	0.24	3.09	1.53	-2.71	46,793.00	1.47	0.81	1.96
2031	1,237.00	5.22	0.24	1.76	0.36	-0.38	0.25	3.01	1.49	-2.60	47,482.00	1.47	0.82	1.96
AVERAGE GROWTH RATE		5.22		1.82		-0.38		3.37		-3.01		1.47		1.96

Source: Created by author based on data of the BiH Central Bank and the BiH Agency for Statistics

Table 34: Projected number of population 0 to 5 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	27,105	27,414	27,508	28,076	28,493	27,467	26,468	25,753	25,050	24,359	23,685	22,976
1	28,810	26,787	27,166	27,210	27,731	28,155	27,145	26,158	25,453	24,758	24,076	23,410
2	29,595	28,554	26,602	26,946	26,946	27,468	27,897	26,892	25,915	25,218	24,530	23,854
3	29,949	29,386	28,409	26,438	26,745	26,746	27,267	27,691	26,692	25,723	25,032	24,350
4	29,956	29,792	29,280	28,288	26,289	26,601	26,602	27,115	27,534	26,539	25,577	24,892
5	29,774	29,844	29,720	29,191	28,169	26,184	26,500	26,495	26,999	27,414	26,422	25,466
Total	**175,189**	**171,778**	**168,685**	**166,148**	**164,374**	**162,622**	**161,879**	**160,104**	**157,643**	**154,011**	**149,322**	**144,949**

Source: Calculated by author

Table 35: Projected number of population 6 to 14 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
6	30,273	29,693	29,797	29,656	29,090	28,080	26,107	26,422	26,410	26,907	27,316	26,327
7	32,515	30,201	29,660	29,749	29,566	29,005	28,007	26,041	26,355	26,336	26,825	27,230
8	34,128	32,434	30,169	29,618	29,665	29,484	28,929	27,937	25,978	26,291	26,266	26,747
9	34,896	34,032	32,389	30,120	29,535	29,582	29,403	28,849	27,864	25,912	26,223	26,192
10	35,914	34,787	33,972	32,322	30,027	29,449	29,498	29,316	28,764	27,785	25,840	26,151
11	36,593	35,795	34,717	33,888	32,210	29,932	29,362	29,408	29,224	28,673	27,701	25,764
12	35,732	36,473	35,720	34,626	33,764	32,102	29,840	29,274	29,317	29,131	28,582	27,617
13	35,027	35,619	36,397	35,624	34,494	33,643	31,998	29,748	29,185	29,226	29,038	28,489
14	35,112	34,918	35,545	36,296	35,481	34,362	33,524	31,889	29,651	29,091	29,129	28,939
Total	**310,190**	**303,953**	**298,364**	**291,899**	**283,834**	**275,639**	**266,670**	**258,887**	**252,749**	**249,353**	**246,920**	**243,455**

Source: Calculated by author

Table 36: Projected number of population 15 to 18 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
15	35,327	34,990	34,837	35,435	36,134	35,327	34,219	33,387	31,764	29,538	28,983	29,018
16	35,585	35,137	34,859	34,671	35,207	35,905	35,107	34,007	33,184	31,575	29,365	28,816
17	36,539	35,259	34,903	34,574	34,317	34,852	35,551	34,755	33,666	32,855	31,268	29,080
18	37,387	36,028	34,888	34,463	34,052	33,808	34,343	35,029	34,239	33,165	32,373	30,814
Total	144,838	141,414	139,487	139,143	139,711	139,892	139,221	137,179	132,853	127,134	121,989	117,728

Source: Calculated by author

Table 37: Projected number of population 19 to 23 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
19	38,691	36,659	35,498	34,273	33,755	33,372	33,141	33,660	34,332	33,551	32,498	31,728
20	39,980	37,743	35,973	34,712	33,390	32,916	32,560	32,325	32,825	33,483	32,712	31,685
21	42,297	38,844	36,932	35,054	33,695	32,439	32,007	31,656	31,416	31,895	32,537	31,781
22	46,889	40,999	37,951	35,934	33,961	32,686	31,490	31,074	30,730	30,484	30,940	31,566
23	50,829	45,417	40,028	36,907	34,802	32,932	31,732	30,568	30,168	29,829	29,577	30,008
Total	218,686	199,663	186,382	176,880	169,603	164,345	160,930	159,283	159,471	159,241	158,264	156,768

Source: Calculated by author

Table 38: Projected number of population 24 to 64 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
24	52,483	49,212	44,337	38,916	35,743	33,761	31,982	30,827	29,694	29,308	28,974	28,715
25	47,826	50,867	48,045	43,122	37,699	34,694	32,819	31,097	29,984	28,880	28,507	28,178
26	41,100	46,416	49,728	46,763	41,827	36,628	33,766	31,960	30,292	29,217	28,139	27,779
27	40,733	39,971	45,446	48,498	45,425	40,706	35,697	32,936	31,192	29,571	28,531	27,476
28	45,855	39,756	39,215	44,412	47,229	44,277	39,740	34,873	32,201	30,513	28,934	27,925
29	48,012	44,894	39,118	38,423	43,352	46,153	43,300	38,898	34,156	31,563	29,923	28,381
30	48,181	47,070	44,262	38,452	37,602	42,454	45,237	42,447	38,164	33,534	31,009	29,411
31	48,646	47,300	46,434	43,586	37,740	36,895	41,675	44,418	41,685	37,511	32,981	30,518
32	49,657	47,815	46,690	45,734	42,848	37,113	36,269	40,963	43,670	40,989	36,914	32,476
33	49,772	48,860	47,237	46,014	44,967	42,190	36,553	35,691	40,305	42,979	40,347	36,364
34	49,929	49,010	48,300	46,591	45,267	44,277	41,596	36,034	35,155	39,694	42,337	39,750
35	50,976	49,199	48,469	47,669	45,870	44,590	43,649	41,041	35,550	34,656	39,123	41,736
36	51,137	50,271	48,683	47,865	46,968	45,221	43,979	43,065	40,526	35,102	34,193	38,593
37	50,915	50,462	49,773	48,108	47,193	46,337	44,635	43,410	42,521	40,047	34,686	33,763
38	50,859	50,275	49,982	49,214	47,462	46,580	45,760	44,083	42,874	42,009	39,596	34,295
39	50,472	50,251	49,816	49,437	48,578	46,866	46,013	45,209	43,556	42,363	41,520	39,165
40	49,948	49,897	49,812	49,296	48,819	47,993	46,316	45,476	44,687	43,057	41,879	41,057
41	49,265	49,410	49,483	49,321	48,711	48,258	47,461	45,802	44,973	44,199	42,591	41,426
42	49,466	48,760	49,023	49,022	48,767	48,178	47,746	46,961	45,319	44,501	43,740	42,153
43	50,136	48,982	48,393	48,588	48,495	48,257	47,687	47,259	46,487	44,861	44,053	43,305

Age												
44	43,626	44,425	46,034	46,795	47,219	47,785	48,008	48,090	47,983	48,629	49,668	50,313
45	44,009	45,603	46,352	46,772	47,334	47,557	47,629	47,512	48,234	49,321	49,860	49,011
46	45,197	45,935	46,350	46,908	47,130	47,205	47,079	47,785	48,938	49,522	48,590	48,067
47	45,550	45,961	46,516	46,737	46,814	46,691	47,381	48,514	49,161	48,280	47,683	48,260
48	45,609	46,160	46,380	46,459	46,339	47,026	48,140	48,769	47,962	47,408	47,908	48,583
49	45,831	46,051	46,132	46,014	46,698	47,804	48,417	47,610	47,126	47,652	48,255	46,626
50	45,742	45,826	45,710	46,390	47,489	48,095	47,287	46,806	47,387	48,007	46,329	46,337
51	45,533	45,420	46,096	47,188	47,787	46,988	46,507	47,081	47,748	46,095	46,057	48,738
52	45,139	45,811	46,896	47,487	46,696	46,223	46,788	47,444	45,850	45,827	48,433	48,898
53	45,537	46,614	47,198	46,414	45,949	46,513	47,154	45,564	45,591	48,174	48,579	50,761
54	46,341	46,917	46,140	45,683	46,244	46,880	45,292	45,319	47,915	48,305	50,419	52,026
55	46,644	45,875	45,424	45,982	46,611	45,034	45,061	47,623	48,038	50,122	51,668	51,930
56	45,618	45,173	45,728	46,350	44,782	44,816	47,346	47,746	49,841	51,356	51,572	51,631
57	44,922	45,475	46,089	44,530	44,571	47,072	47,458	49,528	51,053	51,242	51,273	52,857
58	45,216	45,822	44,271	44,320	46,789	47,166	49,208	50,710	50,915	50,924	52,468	53,228
59	45,551	44,009	44,066	46,503	46,870	48,887	50,364	50,552	50,583	52,080	52,804	53,193
60	43,743	43,808	46,212	46,570	48,561	50,015	50,183	50,206	51,699	52,368	52,727	51,924
61	43,537	45,908	46,258	48,223	49,652	49,806	49,818	51,280	51,942	52,244	51,420	51,606
62	45,577	45,918	47,854	49,260	49,398	49,406	50,835	51,468	51,768	50,893	51,057	48,739
63	45,533	47,440	48,820	48,942	48,944	50,345	50,949	51,227	50,363	50,472	48,152	47,709
64	46,974	48,327	48,431	48,429	49,801	50,380	50,637	49,765	49,881	47,528	47,092	48,044
Total	**1,643,895**	**1,680,455**	**1,717,511**	**1,754,947**	**1,794,128**	**1,833,574**	**1,872,969**	**1,911,161**	**1,949,009**	**1,978,695**	**2,000,692**	**2,023,849**

Source: Calculated by author

Table 39: Projected number of population 65 to 74 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
65	47,803	47,327	46,433	46,898	49,227	49,121	50,000	49,760	49,206	47,865	47,872	47,786
66	46,433	46,989	46,550	45,752	46,194	48,516	48,421	49,305	49,082	48,554	47,243	47,255
67	45,132	45,495	46,109	45,741	44,995	45,429	47,744	47,659	48,546	48,342	47,839	46,560
68	39,340	44,112	44,504	45,197	44,859	44,175	44,603	46,904	46,829	47,720	47,533	47,057
69	37,364	38,305	43,046	43,482	44,213	43,912	43,286	43,703	45,988	45,924	46,818	46,649
70	37,150	36,325	37,249	41,963	42,407	43,176	42,905	42,329	42,736	45,002	44,948	45,843
71	34,170	35,978	35,261	36,177	40,827	41,276	42,074	41,827	41,303	41,697	43,942	43,899
72	30,985	32,943	34,776	34,169	35,049	39,626	40,075	40,895	40,671	40,199	40,581	42,800
73	28,606	29,764	31,693	33,549	33,025	33,862	38,352	38,795	39,635	39,436	39,015	39,382
74	23,623	27,324	28,519	30,419	32,270	31,820	32,610	37,002	37,438	38,295	38,119	37,749
Total	370,606	384,562	394,141	403,345	413,067	420,913	430,070	438,180	441,435	443,033	443,911	444,981

Source: Calculated by author

Table 40: Projected number of population 75 to 84 years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
75	20,143	22,432	26,028	27,255	29,098	30,928	30,547	31,289	35,567	35,996	36,866	36,712
76	19,604	19,045	21,238	24,724	25,952	27,726	29,523	29,204	29,899	34,052	34,473	35,350
77	19,469	18,418	17,943	20,042	23,386	24,603	26,300	28,055	27,795	28,444	32,456	32,868
78	20,380	18,150	17,230	16,839	18,822	22,011	23,204	24,821	26,523	26,321	26,925	30,781
79	21,263	18,829	16,838	16,047	15,716	17,578	20,600	21,761	23,293	24,936	24,786	25,347
80	19,982	19,447	17,304	15,541	14,853	14,577	16,315	19,160	20,282	21,726	23,302	23,200
81	18,205	18,061	17,681	15,808	14,244	13,653	13,426	15,037	17,698	18,775	20,129	21,629
82	16,186	16,260	16,215	15,964	14,329	12,954	12,450	12,268	13,751	16,223	17,247	18,507
83	14,282	14,266	14,417	14,450	14,295	12,881	11,681	11,256	11,114	12,472	14,749	15,714
84	12,228	12,406	12,475	12,678	12,761	12,686	11,472	10,436	10,083	9,977	11,209	13,288
Total	**181,742**	**177,314**	**177,370**	**179,347**	**183,456**	**189,598**	**195,519**	**203,287**	**216,007**	**228,922**	**242,143**	**253,396**

Source: Calculated by author

Table 41: Projected number of population 85+ years of age, 2020-2031, medium variant

Age	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
85	10,351	10,459	10,687	10,812	11,041	11,162	11,147	10,117	9,232	8,945	8,871	9,979
86	8,333	8,708	8,865	9,118	9,273	9,517	9,661	9,691	8,828	8,081	7,852	7,805
87	6,698	6,882	7,251	7,433	7,688	7,863	8,107	8,263	8,326	7,613	6,992	6,813
88	5,054	5,421	5,620	5,966	6,153	6,403	6,582	6,818	6,979	7,063	6,482	5,972
89	4,260	4,002	4,334	4,531	4,841	5,026	5,259	5,434	5,656	5,814	5,910	5,444
90	2,946	3,296	3,128	3,418	3,599	3,873	4,045	4,257	4,422	4,625	4,774	4,873
91	2,333	2,222	2,513	2,408	2,652	2,815	3,050	3,205	3,392	3,542	3,722	3,859
92	1,531	1,712	1,651	1,886	1,823	2,025	2,164	2,361	2,497	2,658	2,790	2,945
93	1,067	1,092	1,236	1,206	1,389	1,356	1,518	1,635	1,796	1,911	2,046	2,158
94	711	736	766	876	864	1,004	989	1,117	1,211	1,339	1,434	1,543
95	463	474	500	528	608	607	711	708	805	880	979	1,055
96	315	300	313	334	358	416	421	496	499	572	629	704
97	250	198	192	203	220	239	281	287	341	346	400	442
98	111	151	122	121	130	143	157	186	192	229	236	274
99	82	65	90	74	75	81	91	101	121	126	152	157
100	116	46	38	53	45	45	50	57	64	77	81	98
Total	**44,621**	**45,762**	**47,306**	**48,966**	**50,757**	**52,574**	**54,233**	**54,734**	**54,360**	**53,820**	**53,347**	**54,121**

Source: Calculated by author

ANNEX 2 – DECOMPOSITION OF THE POPULATION FROM THE POINT OF VIEW OF THE RETIRED POPULATION

The labels for the respective variables are:
- o Number of pensioners/Population = A
- o Population over 65 /Population = B
- o Number of pensioners/Population over 65 = C
- o Number of pensioners/Number of employees = D
- o Working age population/Number of pensioners = E
- o Number of employees/Workforce = F
- o Labor force/Working age population = G

Demographic and labour market factors that determine the share of the retired population in the total population can be presented as follows:

$$\frac{Number\ of\ pensioners}{Population} = \frac{Population\ over\ 65}{Population} \times \frac{Number\ of\ pensioners}{Population\ over\ 65} \times \frac{Number\ of\ pensioners}{Number\ of\ employees} \times \frac{Working\ age\ population}{Number\ of\ pensioners} \times \frac{Number\ of\ employees}{Labor\ force} \times \frac{Labor\ force}{Working\ age\ population}$$

or

$$A_t = B_t \times C_t \times D_t \times E_t \times F_t \times G_t \qquad (2)$$

The equation (2) could be further developed as:

$$\text{Log } A_t = \log B_t + \log C_t + \log D_t + \log E_t + \log F_t + \log G_t \qquad (3)$$

The equation (3) could be developed as
$$a_t = b_t + c_t + d_t + e_t + f_t + g_t \quad (4a)$$
$$a_{t-1} = b_{t-1} + c_{t-1} + d_{t-1} + e_{t-1} + f_{t-1} + g_{t-1} \quad (4b)$$
$$a_t - a_{t-1=} b_t - b_{t-1+} c_{t-} c_{t-1+} d_{t-} d_{t-1+} e_t - e_{t-1+} f_{t-} f_{t-1+} g_t - g_{t-1} \quad (4)$$
since
$$a_t - a_{t-1=} \log A_t - \log A_{t-1=} \log (A_t/A_{t-1}) = \log \{[a_t/a_t]-1+1]\} \approx (A_t - A_{t-1})/A_{t-1}$$

The same could be applied to the following
$$b_t - b_{t-1} \approx (B_t - B_{t-1})/B_{t-1}$$
etc.

ANNEX 3 – GDP GROWTH RATE

The quarterly time series of real GDP is available for the period 2000/Q1-2021/Q1, and its descriptive statistics is shown in Table 43.

Table 42: Quarterly real GDP in Bosnia and Herzegovina in the 2015 prices, 2000/Q1 - 2021/Q1

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	85	2010.129	6.172	2000	2021
GDP	85	6545161	1072266.8	4057204.5	8607260
Time	85	202	24.681	160	244
Time Trend	85	43	24.681	1	85

Source: Created by author based on data from the BiH Agency for Statistics (2022)

Based on quarterly data from 2000/Q1 to 2021/Q1, an average instantaneous quarterly GDP growth rate of 0.63% is calculated. The 0.64 percent translates into an annualized compound GDP growth rate of 2.55%.

Table 43: Average growth rate of the quarterly GDP in Bosnia and Herzegovina, 2000/Q1 - 2021/Q1

Ln (GDP)	Coef.	St.Err.	t-value	p-value	95% Conf	Interval	Sig
Time Trend	.0063	0	17.90	0	.006	.007	***
Constant	15.415	.017	900.24	0	15.381	15.449	***
Mean dependent var		15.680		SD dependent var		0.175	
R-squared		0.794		Number of obs		85.000	
F-test		320.464		Prob > F		0.000	
Akaike crit. (AIC)		-186.961		Bayesian crit. (BIC)		-182.075	
*** p<.01, ** p<.05, * p<.1							

Source: Created by author based on data from the BiH Agency for Statistics (2022)

In Bosnia and Herzegovina, GDP growth rates must exceed 6-7 per cent per year (and being based on strong productivity rate growth of 7% to offset the population shrinking of -1% per year) (see Table 45)

Table 44: Macroeconomic model projections in Bosnia and Herzegovina, 2022-2030

Variable	2022	2023	2024	2025	2026	2027	2028	2029	2030
Productivity Growth (%)	3.5	7	7	7	7	7	7	7	7
Population Growth (%)	-1	-1	-1	-1	-1	-1	-1	-1	-1
Economic Growth (%)	2.5	4.5	6	6	6	6	6	6	6
Gross National Savings	8.6	9.5	10.4	11.6	12.3	13.2	13.8	14.6	15.3
Gross National Income	38.5	40.3	42.7	45.6	48.7	51.9	54.9	58.2	61.6
Gross domestic product (Y)	38.8	40.6	43.0	45.6	48.4	51.3	54.3	57.6	61.0
Final private consumption (C)	25.6	27.2	28.8	30.5	32.4	34.3	36.4	38.6	40.9
Final government consumption (G)	7.8	8.2	8.7	9.3	9.8	10.4	11.0	11.7	12.4
Current Account (S-I)= Borrowing from abroad	-4.0	-5.8	-5.7	-5.4	-5.8	-5.9	-6.4	-6.9	-7.4
Gross savings	9.8	10.2	10.9	11.8	12.7	13.4	14.3	15.3	16.2
SAVINGS GAP	-2.8	-5.1	-5.2	-5.2	-5.4	-5.7	-5.9	-6.2	-6.5
RESOURCES GAP (capital inflows)	-7.5	-10.4	-10.9	-11.2	-11.6	-12.0	-12.7	-13.5	-14.3
FISCAL GAP (public revenues minus public expenditures)	-1.2	-1.0	0.0	0.5	0.7	0.9	1.1	1.3	1.5
Private saving	8.8	9.3	8.7	8.6	8.9	9.1	9.3	9.5	9.8
Public saving	-1.2	-1.0	0.0	0.5	0.7	0.9	1.1	1.3	1.5
Gross fixed capital formation	12.2	14.7	15.6	16.6	17.6	18.6	19.7	20.9	22.2

Source: Calculated by author