MINISTRY OF LABOUR AND SOCIAL PROTECTION

ИНСТИТУТ

Insightful Innovative Strategic

LABOR MARKET OF MONGOLIA: MID-TERM DEMAND AND SUPPLY FORECASTING

STUDY REPORT

Ulaanbaatar city

2024

Study is performed by:

Ministry of Labor and Social Protection of Mongolia (MLSP)

Training, Assessment and Research Institute of Labor and Social Protection (TARILSP)

MMCG LLC Research and Consulting Firm

Verified by:

S.Dambii	Head of Employment Policy Implementation and Coordination Department, MLSP
B.Altantulga	Head of Division of Employment and Workplace Promotion of Employment Policy Implementation and Coordination Department, MLSP
N.Zoljargal	Officer in charge of Labor Market Data and Estimation of Employment Policy Implementation and Coordination Department, MLSP

Study team members:

B.Batbaatar	Director of TARILSP
M.Dorjpagam	Head of Research Department, TARILSP
N.Jargalsaikhan	Cheif of Employment Policy Research Unit, TARILSP
D.Lkhagvasuren	Economics Faculty Teacher of Concordia University, Canada (associate professor), Member of CIREQ Center of Quantitative Research, Canada, Member of Editorial Council of the "Journal of Labor Research", USA, Doctor of Economic Science (Ph.D)
N.Batnasan	Director of Business School, National University of Mongolia (NUM), Professor, Doctor of Business Administration (Ph.D)
Ts.Batsukh	Professor in the Economics Department, University of Finance and Economics (UFE), Doctor of Economic Science (Ph.D)
B.Enkh-Amgalan	Associate Professor in the Finance Department of the Business School, NUM, Doctor of Economic Science (Ph.D)
S.Tsolmon	Associate Professor in the Economy and Business Department, Mandakh University, Doctor of Business Administration (Ph.D)
M.Erdenebayar	Academic Secretary of School of Economics and Business, Mongolian University of Life Science (MULS), Doctor of Economic Science (Ph.D)
Ch.Davaasuren	Research and Development Director, MMCG Research and Consulting Firm, Master of Business Administration (MBA)
D.Bum-Erdene	Executive Director of MMCG Research and Consulting Firm, Master of Business Administration (MBA)
P.Tuvshinmandakh	Director of Research and Planning Department, MMCG Research and Consulting Firm, Master of Business Administration (MBA)
E.Gantuya	Chief Statistician of Household-based Research Division of Social Statistics Department, National Statistic Office of Mongolia
B.Khoschimeg	Research Manager of Social Research Department, MMCG Research and Consulting Firm
D.Urangua	Research Manager of Business Research Department, MMCG Research and Consulting Firm

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FOREWORD

Mongolia's economic growth has averaged 5.4% in the last 20 years, and despite the increase in jobs and wages, employment has decreased by about 5%. Thus, less than 60% of the working-age population is participating in the labor market.

Countries with a market economy have paid great attention to the scientific forecasting of labor demand and the provision of data necessary for policymakers to make decisions.

It has been more than 10 years since research on labor market trends, labor force demands, and shortages in Mongolia has been conducted annually on a short-term basis. Since this barometric survey cannot be used in the mid and long term, a survey on the jobs demanded in the labor market of Mongolia until 2035 was conducted by comparing the methodologies and models of internationally accepted labor-specialized research and analysis organizations.

I believe that the results of this study will serve as the basis for creating a policy framework to support employment, developing the skills required in the labor market, ensuring coordination between the educational industry and the labor market, analyzing interactions between macro and micro levels, and estimating policy changes, economic shocks, interdisciplinary correlations, and employment effectiveness. This will make a real contribution to Mongolia's economic growth and community.

The study was conducted in collaboration with the Ministry of Labor and Social Protection of Mongolia, Training, Assessment and Research Institute of Labor and Social Protection, and MMCG LLC Research and Consulting Firm's teams. I would like to express my appreciation to the stakeholders for their support and assistance.

I encourage you to read the study results, utilize them in your activities, and provide us with your suggestions and opinions about the study.

MEMBER OF THE PARLIAMENT,
MEMBER OF THE GOVERNMENT OF MONGOLIA,
MINISTER OF LABOR AND SOCIAL PROTECTION KH.BULGANTUYA

ABBREVIATIONS

ABS	The Australian Bureau of Statistics
ACS	American Community Survey
ASFR	Age-Specific Fertility Rate
BLS	Bureau of Labor Statistics
CPI	Consumer Price Index
DEIB	Diversity, Equity, Inclusion, and Belonging
ETS	Engineering and Technical Staff
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HPP	Hydropower Plant
ICT	Information and Communication Technology
ILO	International Labor Organization
IMF	International Monetary Fund
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISIC	International Standard Industrial Classification
JSC	Joint Stock Company
LFPR	Labor Force Participation Rate
LFS	Labor Force Survey
LFS	Labor Force Survey
LLC	Limited Liability Company
LM	Labor Market
LRI	Labor Research Institute
MCA	Millennium Challenge Account – Mongolia
MCUD	Ministry of Construction and Urban Development
MES	Ministry of Education and Science
MLSP	Minister of Labor and Social Protection
MMHI	Ministry of Mining and Heavy Industry
MNCCI	Mongolian National Chamber of Commerce and Industry
MNT	Mongolian Tugrug
MNUMS	Mongolian National University of Medical Sciences
MoE	Ministry of Energy
MOFALI	Ministry of Food, Agriculture, and Light Industry
MoH	Ministry of Health
MRPAM	Mineral Resources and Petroleum Authority of Mongolia
MRTD	Ministry of Road and Transportation Development
MUST	Mongolian University of Science and Technology
NSO	National Statistics Office
NUM	National University of Mongolia
SDG	Sustainable Development Goals
SOE	State-Owned Enterprise
STEM	Science, Technology, Engineering, and Mathematics
TARILSP	Training, Assessment and Research Institute of Labor and Social Protection

TCP	Central Treatment Plant
TFR	Total Fertility Rate
TPP	Thermal Power Plant
TVET	Technical and Vocational Education and Training
UFE	University of Finance and Economics
UNDP	United Nations Development Programme
USD	United States Dollar
VAT	Value Added Tax
WHO	World Health Organization

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1. SUMMARY

The mid-term (2024-2035) demand and supply forecasting of Mongolia’s labor market was jointly conducted by the MLSP, TARILSP, and MMCG LLC Research and Consulting Firm.

This forecasting was developed based on available data, utilizing internationally accepted methodologies for labor market forecasting, including Economic modeling, Demographic analysis, Occupational and industry projection, Scenario planning, and Global economic trends analysis. Depending on the availability, quality, and coverage of data, information from 229 countries worldwide and Mongolia's statistics since 1990 were utilized to determine international and national population dynamics, economic trends, and labor market conditions. Subsequent forecasts were developed based on these trends and scenarios.

The results of the analysis conducted within the framework of the study summarize the trend and state of supply and demand in the labor market as follows:

- Although the level of labor force participation in Mongolia is decreasing, it aligns with the standards of neighboring countries in terms of population structure and economic development. **This decline in labor force participation is also observed globally.**
- **The duration of unemployment is 7.5 months, lower than the international average.** A shorter duration indicates a higher probability of finding a job. Additionally, Mongolia's unemployment rate is comparable to that of regional and developed countries.
- The primary influencing factor in Mongolia's labor market is the real wage rate, which regulates supply and demand. **Real wages have remained stagnant over the last decade**, with the share of real wages in Gross Domestic Products (GDP) lagging 8.7-13.3 points behind countries of similar economic development levels. This disparity negatively impacts labor market supply and labor force participation. **Allocating approximately 51% of total income to labor and the remaining percent to capital is necessary.** Therefore, increasing productivity is essential to raise wages.
- **The informal economy is on the rise.** Inflation diminishes citizens' purchasing power, leading to increased interest in working in the informal sector rather than the formal sector.
- **There is insufficient demand for casual occupations,** and young people underestimate opportunities for vocational education.
- **High interest in working abroad persists and is not expected to decrease.** Without measures to reduce migration and stimulate return migration, migration is projected to reach 206,600 by 2035, a 68.9% increase from 2020.
- **Recent labor force shortages stem from demographic factors.** The low birth rate period from 1991-2005 resulted in 15-20 thousand fewer births annually than the previous 30-year average, totaling 250-300 thousand fewer children. This demographic trend affects the labor market, with the effects expected until 2028 when the number of 20-34-year-olds is anticipated to increase nationwide.
- With diminishing new labor force supply due to demographic dynamics, past births, and foreign migration, **multidisciplinary efforts are crucial.** Budget, monetary, and active labor market policies should support employment and foster productive job creation. Businesses must intensify efforts to recruit, train, and retain new and young labor force.
- **Accelerating and sustaining economic growth is imperative.** Recent economic performance has fallen short of "Vision-2050" goals due to economic slowdown from the

Covid-19 pandemic impact. **To meet 2030 and 2035 goals, economic growth rates should be intensified, maintaining growth above 7%.**

- Despite average economic growth of 6.9% from 2000 to 2022, productivity growth remained stagnant. **Future economic growth hinges on productivity growth, technological reforms, and developing value-added production.**
- Addressing migration toward Ulaanbaatar city is vital; job creation in rural and local areas is necessary. **Provinces must achieve GDP growth rates exceeding 6% to stabilize migration.** Infrastructure improvements and intensified production are essential for provincial development.
- Estimated investments matching the Oyutolgoi investment in 2011 are needed to ensure economic growth. Foreign Direct Investment (FDI) of at least 2.5 billion US dollars, coupled with GDP investments of about 30%, are crucial to meet Vision 2050 goals. The 2035 target requires a 5-7% increase in investment.
- Labor market shortages are not expected until 2050, with Mongolia's total population reaching 4,093,200 by 2035. Dependency ratio will decrease, with 73% of the total population being working-age individuals. An estimated 1.8-1.9 labor force is needed to meet GDP growth targets.
- Labor market supply and demand forecasting requires consideration of economic conditions, industry growth, labor force demand and supply, population dynamics, foreign migration, and potential differences. **Recruiting foreign labor forces with high technical and technological skills is recommended.**
- **Given that Gen Z will comprise a significant portion of the future labor force**, radical reforms in human resource policies are necessary starting now. By 2035, out of 3 million working-age individuals, 1.3 million will be born after 2000.
- Due to increased life expectancy in Mongolia, the elderly population's burden will continue to rise, while the young population's burden will decrease due to declining birth rates. Short- and medium-term policies should reflect this period of declining demographic load.

Following the analysis and projections of Mongolia's labor market supply and demand trends, a total of 46 recommendations are presented across five policy areas and activities aimed at enhancing employment opportunities and maintaining the equilibrium between labor market supply and demand.

1. **Establish a comprehensive policy framework to bolster employment (10 recommendations):**
    - Incorporate the promotion of stable employment as a primary objective of State monetary policy.
    - Establish a Labor Market Policy Council to oversee strategic initiatives.
    - Review and amend the Employment Support Law (2011) to better align with current needs.
    - Ensure robust implementation of government initiatives aimed at bolstering labor market demand.
    - Expand the mandate of the Ministry of Labor and Social Protection to encompass a broader scope of employment policy functions etc.
2. **Foster the development of skills aligned with labor market demand and enhance coordination between the education sector and the labor market (8 recommendations):**
    - Amend accreditation requirements and criteria for higher education and vocational institutions to reflect current demands.

- Direct scholarships and loans from the Education Loan Fund toward Science, Technology, Engineering, and Mathematics (STEM) disciplines etc.

3. **Strengthen the capacity of common employment services and support activities (10 recommendations):**
    - Transition from reactive to proactive service provision in response to labor market needs.
    - Diversify private labor exchange, training, and consulting services based on industry and occupation.
    - Facilitate cross-sector collaboration.
    - Regulate part-time and temporary employment in accordance with labor laws to protect the rights of both employers and employees etc.
4. **Implement policies and initiatives to enhance productivity across all levels (14 recommendations to implement at macro, meso, and micro levels):**
    - Foster a Productivity Ecosystems for Decent Work through a comprehensive policy/program.
    - Launch and execute a "Productivity Revolution" initiative at the governmental level.
    - Facilitate social dialogue to explore avenues for increasing productivity and creating decent jobs etc.
5. **Enhance labor market research and information dissemination to inform policymakers and citizens (4 recommendations):**
    - Integrate employment services into the e-Mongolia platform for public services.
    - Establish an integrated database on citizens' education, occupation, and employment for research and planning purposes.
    - Publish and distribute reports containing information on in-demand occupations, labor force requirements, necessary skills, work environments, and wage expectations etc.

CHAPTER 2
CURRENT CONDITIONS OF LABOR MARKET

2. CURRENT CONDITIONS OF LABOR MARKET

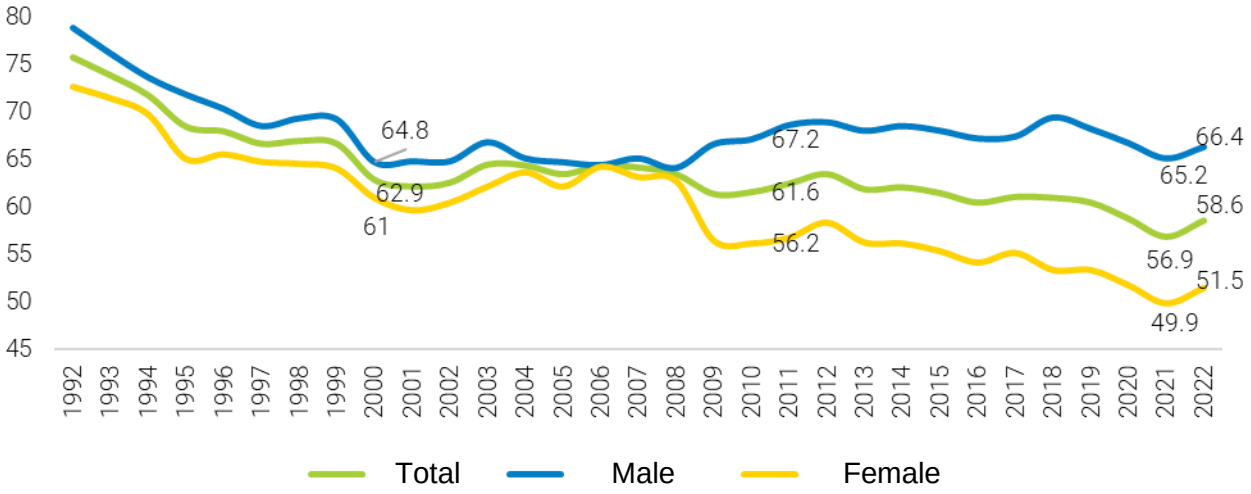
2.1. Main indicators of labor market

This section outlines the primary indicators of Mongolia's labor market, including those essential for monitoring the implementation of the Sustainable Development Goals (SDGs). In addition to indicators specified under Goal 8, which aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, this section also covers indicators outlined in Goal 5, which focuses on achieving gender equality and empowering all women and girls, as well as Goal 9, which aims to build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

Labor force participation rate

The labor force participation rate (LFPR) denotes the proportion of a country's working-age population actively engaged in the labor market through employment or job-seeking activities. Put simply, it measures the extent to which the labor force, capable of producing goods and delivering services, compares to the total working-age population.

Figure 1: Labor force participation rate, 1992-2022, by gender



Source: NSO, 1212.mn

Over time, Mongolia has witnessed a consistent decline in the Labor Force Participation Rate (LFPR) since the inception of market relations until 2008. This decline was relatively similar among both men and women. However, since 2009, a notable gender disparity has emerged, with women consistently exhibiting lower LFPR levels. Additionally, labor supply among women aged 50 and above has remained notably low.

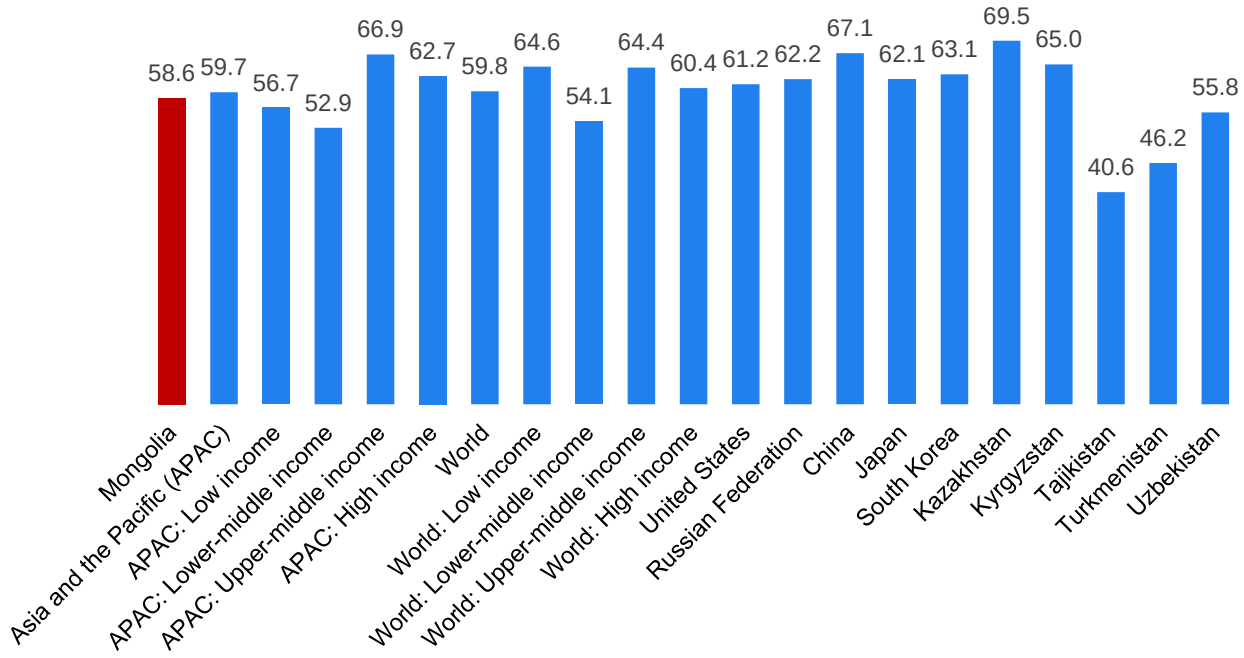
Boosting women's participation in the labor force stands as a crucial objective for Mongolia, holding significant potential for enhancing economic growth. Yet, achieving this goal poses a substantial challenge. As of 2022, women's LFPR stood at 51.5%, while men's was notably higher at 66.4%. Notably, a significant portion of unpaid household work continues to fall on women's shoulders.

Gender disparities in the labor market stem from various factors, including marital responsibilities, household duties, entrenched social stereotypes, and expectations regarding gender roles. Moreover, inadequate political and societal support, coupled with insufficient care services for dependents, further hinder women's employment prospects. Without substantial policy implementations and supportive programs, along with the creation of an enabling environment, these disparities are likely to persist.

Currently, women hold 40.0% of managerial positions, reflecting a significant indicator of progress. However, broader employment metrics indicate that women still face comparatively limited opportunities compared to men. An essential measure of gender equality in employment lies in achieving the fifth Sustainable Development Goal (SDG 5.5.2), which monitors the proportion of women in managerial roles. Nationally, out of 58.3 thousand individuals occupying managerial positions, 23.3 thousand (40.0%) are women, while 35.0 thousand (60.0%) are men.

Although Mongolia's LFPR has been on a declining trajectory, it remains in line with countries sharing similar population structures and economic development levels. For instance, in 2022, the global average LFPR stood at 59.8%, with the Asia-Pacific region averaging 59.7%. Notably, countries such as Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan recorded LFPR levels below Mongolia's average. Among low to middle-income countries, the average LFPR was 54.1%. Please refer to the figure below for a visual representation.

Figure 2: Labor force participation rate, by countries, percent



Source: ILO

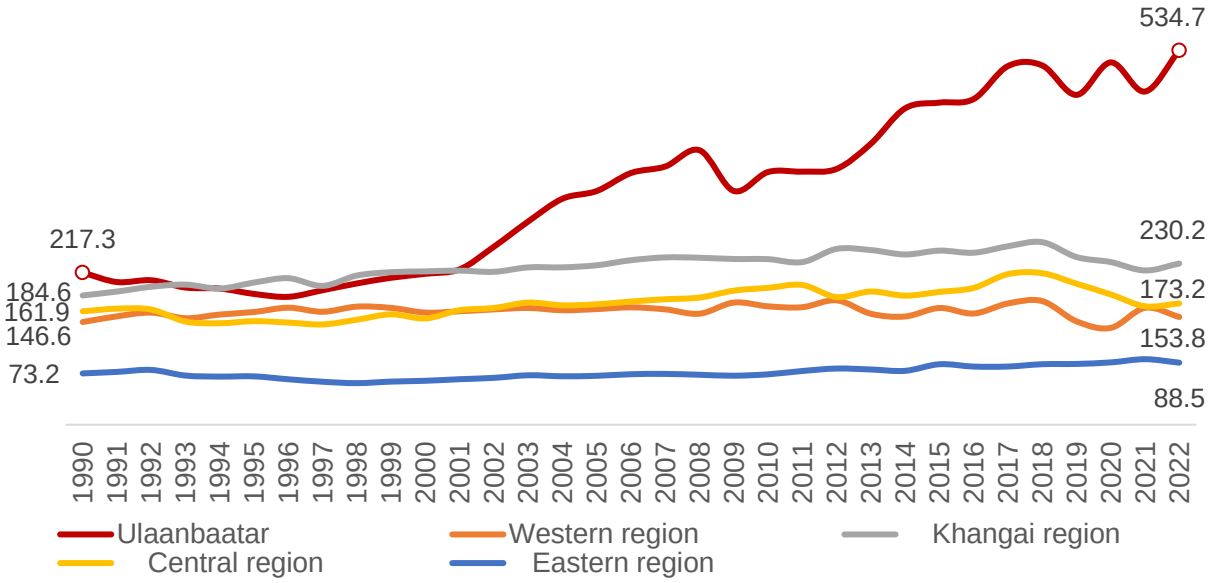
Number of employees

As of the end of 2022, Mongolia's total employed workforce numbered 1,180,500 thousand individuals, with 534,700 situated in Ulaanbaatar city. The count of local employees has remained relatively stagnant since 1990. For instance, in 1990, there were 73,200 employees in the eastern region, which marginally increased to 88,500 by 2022. However, over the past three

decades, the number of employees in Ulaanbaatar city has surged by 2.5 times. Despite Ulaanbaatar occupying a mere 0.5% of Mongolia's total territory, 47.6% of the entire population resides there, leading to significant population concentration.

This concentrated urbanization has yielded adverse effects on society, economics, urban planning, human health, and the environment, notably contributing to the city's notorious traffic congestion. The primary impetus for individuals migrating to Ulaanbaatar is to secure employment, enhance income prospects, pursue higher education, access healthcare services, and improve overall livelihoods. Consequently, fostering interest in local employment opportunities necessitates concerted efforts to bolster regional development, enhance infrastructure, and establish conducive living conditions across local areas, thereby fostering a balanced approach to regional growth.

Figure 3: Number of employees, by location, thousand

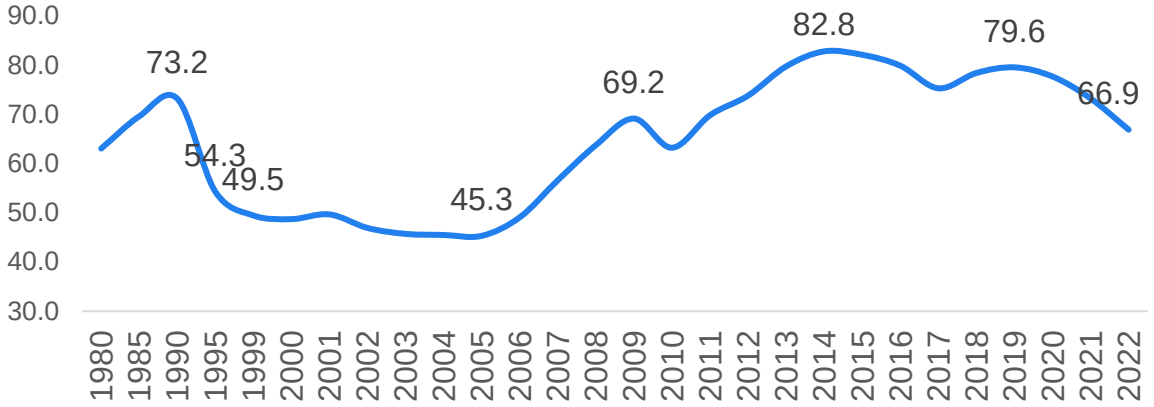


Source: NSO, 1212.mn

The labor force shortage stems primarily from demographic factors. Between 1991 and 2005, Mongolia experienced its lowest birth rates, averaging around 45,000 to 50,000 births annually. Compared to the preceding three decades, where the average birth rate stood at 65,000 annually, this period saw a shortfall of 15,000 to 20,000 births per year. Over this 16-year span, there was a notable decline of 240,000 to 320,000 births. Today, individuals born between 1990 and 2005, aged 18 to 33, constitute the primary demographic entering the labor market, reflecting the impact of this low birth period on workforce numbers.

Furthermore, there has been a decline in the number of university graduates over the past five years. For instance, while 32,200 youths graduated from universities in the last 13 years, this figure dwindled to 23,000 in both 2018 and 2022, indicating a concerning trend in higher education attainment.

Figure 4: Number of births, thousand



Source: NSO, 1212.mn

Workers in manufacturing industry

9.5% of the total workforce is employed in the manufacturing industry. In alignment with national objectives to foster inclusive and sustainable industrialization and enhance the industrial sector's contribution to GDP by 2030, the indicator of the percentage of workers in the manufacturing industry has been integrated into Goal 9, specifically under target 9.2.2 of the Sustainable Development Goals (SDGs), titled "Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization, and Foster Innovation." Specifically, 112,700 individuals, constituting 9.5% of all employees, are engaged in the manufacturing sector. In terms of gender distribution, 57,300 male workers (9.1%) and 55,400 female workers (10.0%) are employed within this industry.

Employees, by employment status

According to the labor force survey, the proportion of paid full-time employees reached its peak in 2021 at 32.2%. This increase may be attributed to the stability of government and private sector employment during the pandemic, while temporary job opportunities were halted. However, in 2022, the share of paid full-time employees decreased to 22.3%, accompanied by a rise in the proportions of paid temporary employees and paid casual workers. This shift indicates a post-pandemic labor market recovery characterized by an uptick in temporary and casual employment opportunities.

Comparing employee statuses to the previous year, paid full-time employees decreased by 99,800 (27.5%), whereas paid temporary workers surged by 123,100 (45.9%). Across economic sectors, the number of paid full-time employees notably declined by 40,000 in construction, wholesale and retail trade, car and motorcycle repair, and service, and transport and warehousing. Conversely, the count of paid temporary workers increased by 32,100, signaling a pronounced transition from permanent to temporary employment within these industries in recent years.

Table 1: Employees, by employment status, thousand people

Status in employment	2019	2020	2021	2022
Total	1 146.2	1 162.9	1 125.6	1 180.5
Employers	36.2	32.8	41.8	41.7
Employers in corporations	14.2	14.4	21.1	19.7

Employers in household market enterprises	22.0	18.4	20.7	22.0
Independent workers without employees	375.2	401.5	391.5	404.0
Owner-operators of corporations without employees	16.0	16.7	10.5	15.0
Own-account workers in household market enterprises without employees	359.2	384.8	381.0	389.0
Dependent contractors	14.1	1.4	3.2	4.0
Employees	679.8	693.0	667.1	705.8
Permanent employees	307.6	317.3	362.5	262.7
Fixed-term employees	292.7	317.1	267.9	391.0
Short-term and casual employees	77.0	58.3	32.0	47.7
Paid apprentices, trainees and interns	2.5	0.3	4.7	4.4
Contributing family workers	36.2	30.8	16.9	21.1
Workers not classified in above statuses	4.7	3.4	5.1	3.9

Source: NSO, 1212.mn

Unemployment rate

As of 2022, there are 84,700 individuals classified as unemployed, while an additional 138,500 people experience underutilization in the labor market, indicating a broader spectrum of labor underutilization. Utilizing the "labor under-utilization indicator" offers a more nuanced understanding of the gap between labor supply and demand. Among the unemployed are 8,800 part-time workers seeking additional work for increased income. Moreover, 44,900 individuals constitute the potential labor force, including those currently unable to work or not actively seeking employment.

The labor under-utilization rate stands at 10.6%, with an unemployment rate of 6.7%. The goal by 2030 is to achieve full and productive employment for the working-age population, supporting decent work and equal pay. The unemployment rate is a component of Goal 8 under target 8.5.2 of the Sustainable Development Goals (SDGs), which aims to promote sustained, inclusive, and sustainable economic growth, alongside full and productive employment.

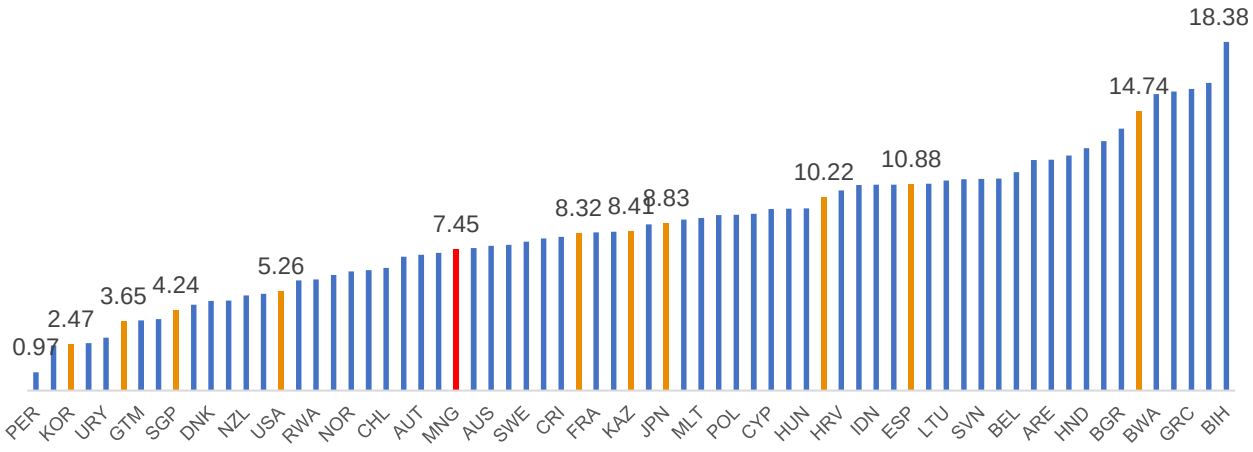
It is essential to consider labor underutilization comprehensively, beyond just unemployment rates, when devising strategies to achieve these goals. The under-utilization rate is 10.6%, with 11.2% for men and 9.8% for women, compared to a national unemployment rate of 6.7%, with 7.4% for men and 5.8% for women.

A concerning aspect is the youth unemployment rate, with 15.4% of individuals aged 15-24 unemployed and not engaged in educational or training programs. To fully capture the labor market challenges faced by youth, the indicator "8.6.1 percentage of youth aged 15-24 who are not employed or enrolled in education in the population of that age group" is included under SDG Goal 8. These youths often lack marketable skills, hindering their employability and potentially impeding long-term economic growth. Nationally, 59,300 youths aged 15-24 are neither employed nor enrolled in education or training programs. Among the working-age population, comprising 383,900 youths aged 15-24, 29.0% participate in the labor force, with an employment rate of 25.2% and an inactivity rate of 71.0%.

Unemployment duration

One key indicator of the labor market's health is the duration of unemployment. Our advisory team conducted an analysis across 69 International Labor Organization (ILO) countries to assess this metric. In our country, the average duration of unemployment stands at 7.45 months, which falls below the global average of 8.67 months (with a standard deviation of 3.73 months). Put simply, individuals seeking employment typically secure a job within an average of 7 months and 14 days, indicating a relatively favorable job-finding environment compared to other nations.
Among the surveyed countries, Bosnia and Herzegovina reported the highest unemployment duration, while Peru exhibited the lowest. This comparative insight underscores our country's comparatively favorable conditions for securing employment within a reasonable timeframe.

Figure 5: Unemployment duration, by countries



Source: ILO

Real wage

For individuals considering labor participation, wage constitutes the most significant factor. Despite nominal wage growth over recent years, real wages have not experienced substantial increases, as illustrated in the table below. In 2012, the average monthly wage for employees stood at 557,600 MNT, escalating to 1,503,800 MNT by 2022, marking a 169% increase over the past decade. However, when converted to US dollars, wages have exhibited a decline since 2013, partly attributable to the depreciation of the MNT against the US dollar.
The real wage index, calculated with the 1995 Consumer Price Index (CPI) as the base (100), has only increased by 31% over the last 10 years. This discrepancy between nominal and real wage growth underscores the challenges faced by workers in maintaining purchasing power amidst inflationary pressures and currency fluctuations.

Table 2. Nominal wage, in MNT and USD, real wage index, 2000-2022

Year	Average wages and salaries, in thousand MNT	Average wages and salaries, in USD	Real wage index (CPI, 1995=100)
2000	62.3	57.9	28.4
2001	65.2	59.4	27.5
2002	71.3	64.2	29.6
2003	81.5	71.1	32.3
2004	93.	78.5	33.2

2005	101.2	84.0	33.0
2006	127.7	108.3	39.2
2007	173.	147.8	45.1
2008	274.2	235.1	58.6
2009	300.4	208.9	61.5
2010	341.5	251.8	61.9
2011	424.2	335.2	70.6
2012	557.6	410.2	81.4
2013	774.9	**507.9**	100.6
2014	796.6	438.1	93.2
2015	808.	410.0	92.7
2016	861.9	401.3	97.7
2017	944.5	387.0	100.6
2018	1,002.9	405.6	98.8
2019	1,124.3	422.0	105.2
2020	1,220.6	433.8	111.7
2021	1,279.4	449.0	102.9
2022	1,503.8	478.2	106.8

Average hourly wages for paid employees

The gender-based wage difference in our country stands at 20.6%. Monitoring gender pay equity is crucial for ensuring fair compensation practices between male and female workers. The gender pay gap indicator, included under SDG Goal 8, tracks whether the average hourly wages of men differ from those of women.

As per indicator "8.5.1. Average hourly wages of employees, in MNT, by gender", the average hourly salary for male workers is 6.4 thousand MNT, whereas female workers earn an average of 5.1 thousand MNT. This disparity underscores the importance of addressing gender-based wage discrepancies and promoting equal pay for equal work. Achieving gender pay equity is integral to fostering sustained, inclusive, and sustainable economic growth, as well as ensuring full and productive employment opportunities for all.

Share of real wages in GDP

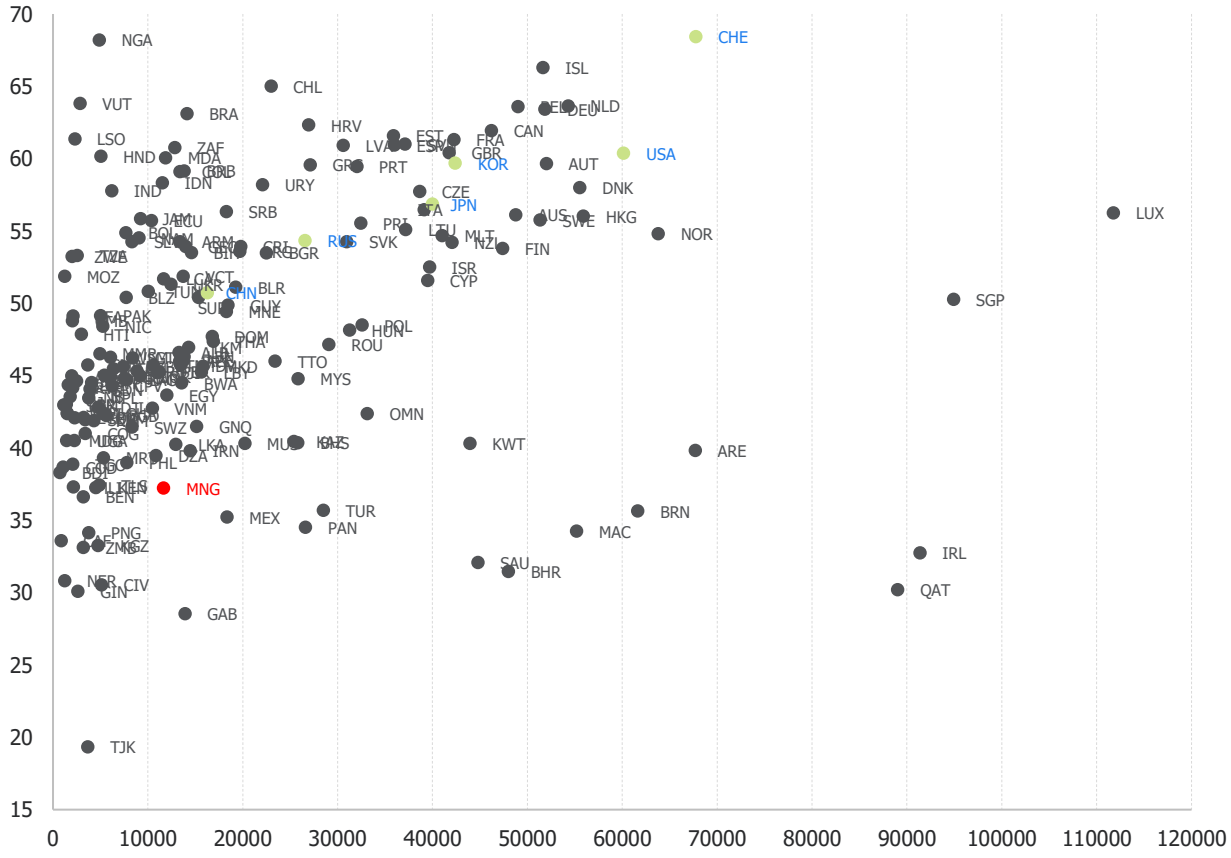
One crucial indicator for labor market policymakers to consider is the share of real wages in GDP. A higher share can significantly impact household income positively, whereas a lower share may contribute to lower household income. A lower share could indicate higher profits for employers or increased taxes. Conversely, a higher share of wages can bolster household income, thereby stimulating economic growth through increased consumer spending.

Analyzing data from 184 countries compiled by the International Labor Organization (ILO), our country's share of total wages in GDP stood at 37.2% in 2020, ranking 164th globally. Comparatively, the USA, South Korea, Japan, Russia, and China reported shares of 60.4%, 59.7%, 56.8%, 54.3%, and 50.7%, respectively, with Switzerland leading at 68.4%.

When considering countries with similar population structures and GDP per capita as Mongolia, our country's share of wages in GDP falls short by 8.7-13.3 units. To align with these comparable nations, Mongolia's share of wages in GDP would need to range between 45.9% and 50.5%.

Achieving this target could potentially enhance household income levels and contribute to a more balanced and sustainable economic growth trajectory.

Figure 6: Share of wages in GDP, by countries

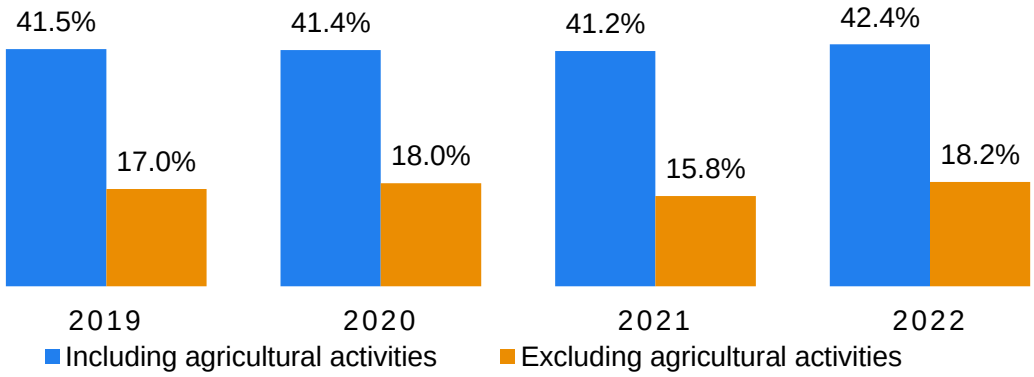


Source: ILO

Informal employment

As of 2022, 42.4% of all employees, totaling 500.3 thousand individuals, are engaged in the informal economy. This encompasses workers across various sectors, including agriculture. In contrast, 215.4 thousand individuals are employed in the non-agricultural sector at the national level, accounting for 18.2% of the total employed workforce.

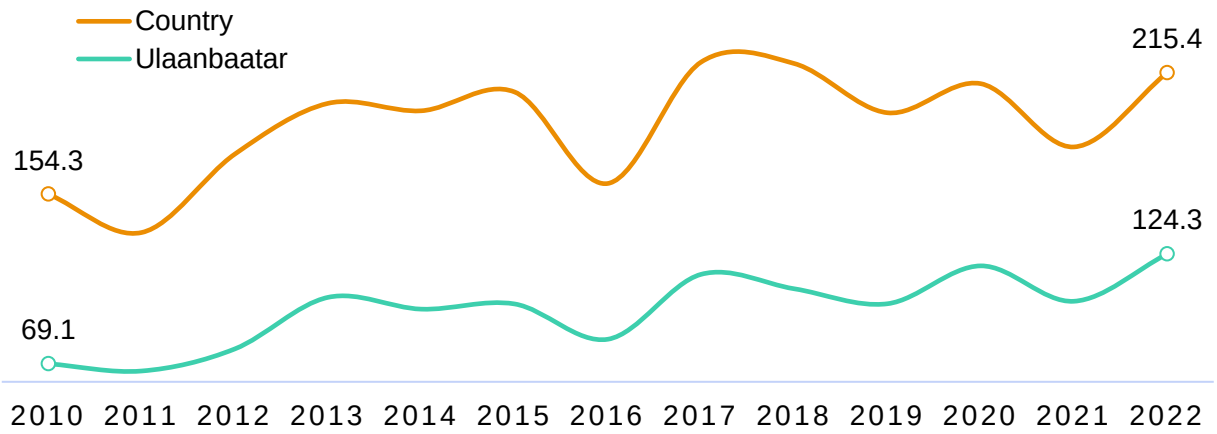
Figure 7: Share of informal employment among total employees



Source: NSO, 1212.mn

The informal economy within the non-agricultural sector has exhibited steady growth over the past decade. Specifically, employment within the non-agricultural sector of Ulaanbaatar surged by 80%, reaching 124.3 thousand by 2022. At the national level, this growth amounted to a 40% increase.

Figure 8: Informal employment in the excluding agricultural sector, thousand



Source: NSO, 1212.mn

Among informal workers in the non-agricultural sector, 77% are employed in key industries such as wholesale and retail trade, manufacturing, construction, transportation, and warehousing.

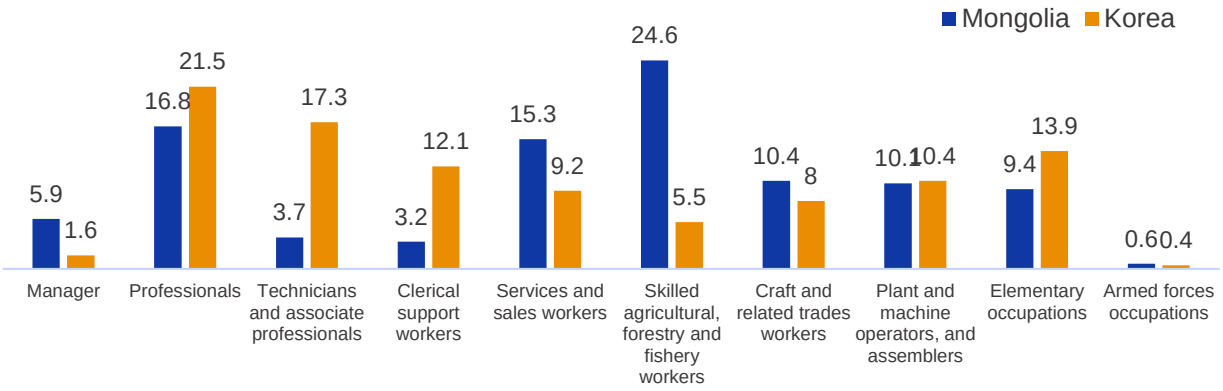
Number of employees, by occupation

As of 2022, the distribution of employees in Mongolia according to the National Occupation Classification and Definition (YAMAT-08/ISCO-08) is as follows: Managers - 5.9%; Professionals - 16.8%; Technicians and associate professionals - 3.7%. Additionally, the percentage of employees in Services and sales workers, as well as Skilled agricultural, forestry and fishery workers, ranges from 15% to 25%, depending on the economic structure of our country.

Comparing the occupational structure of Mongolia with South Korea based on ILO statistics reveals notable differences. The unit weight of Technicians and associate professionals and, Clerical support workers in Mongolia is considerably lower than in South Korea by several points. Specifically, in South Korea, 17.3% of all workers are Technicians and associate professionals, which is 4.7 times higher than in Mongolia. Conversely, the number of managers in Mongolia is relatively small in comparison.

These findings suggest that Mongolia may have a lower level of technological advancement and a shortage of specialists capable of working with advanced technology. Addressing this gap could be crucial for fostering technological development and enhancing the country's economic competitiveness.

Figure 9: Occupational structure, Mongolia and South Korea, 2022



Source: NSO, 1212.mn; ILO

- Managers: Tasks involve solving complex problems and making decisions based on both theoretical and practical knowledge. This role often requires a wide range of practical and technical expertise. Typically performed by individuals holding a diploma, bachelor's degree, or higher qualification.
- Professionals: Responsibilities include addressing complex problems, making decisions, and approaching tasks with creativity, drawing on theoretical and practical knowledge. Typically carried out by individuals with a bachelor's degree or higher qualification.
- Technicians and associate professionals: Involves performing complex technical and practical tasks that demand a broad spectrum of practical, technical, and procedural knowledge in the relevant field. Typically undertaken by individuals with a diploma or bachelor's degree qualification.
- Elementary occupations: These roles encompass jobs that primarily entail physical or manual labor and endurance. They are typically suited for individuals with lower or primary education levels.
- Other (Clerical support workers; Services sales workers; Skilled agriculture, forestry and fishery workers; Craft and related trades workers and; Plant and machine operators, and assemblers): Tasks may include working with machinery and electrical equipment, operating vehicles, and repairing mechanical and electrical equipment. This category also involves organizing, classifying, and storing information. Suitable for individuals with completed secondary education or technical qualifications.

An analysis of occupational structures across economic sectors reveals notable disparities. For instance, in the manufacturing industry of our country, 7.8% of employees hold managerial positions, whereas in South Korea, this figure is only 2.5%. Conversely, the proportion of Technicians and associate professionals is significantly higher in Korea at 22.8%, compared to just 1.7% in Mongolia. Furthermore, 42.1% of our country's manufacturing sector employs Craft and related trades workers and; Plant and machine operators, and assemblers with completed secondary and technical education, contrasting with a proportion 2.8 times lower in South Korea. These discrepancies suggest a limited utilization of technology in Mongolia, with a predominant reliance on manual labor. Consequently, productivity levels remain low.

Table 3: Occupational structure of workers in Mongolian and South Korean industries, 2022

Sector	Country	Manager	Professionals	Technicians and associate professionals	Clerical support workers	Services and sales workers	Craft and related trades workers	Plant and machine operators, and assemblers	Elementary occupations	Total
Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities	South Korea	2.2%	11.3%	**27.2%**	0.5%	2.3%	6.1%	28.1%	**21.6%**	100 %
	Mongolia	3.0%	**20.2%**	5.7%	3.5%	3.5%	**16.5%**	35.7%	11.9%	100 %
Manufacturing	South Korea	2.5%	14.0%	**22.8%**	0.3%	2.3%	14.8%	**33.3%**	9.9%	100 %
	Mongolia	**7.8%**	9.7%	1.7%	1.5%	7.0%	**42.1%**	11.9%	**17.7%**	100 %
Construction	South Korea	2.7%	10.7%	**15.0%**	0.1%	0.8%	46.5%	8.4%	15.6%	100 %
	Mongolia	**7.2%**	14.8%	2.4%	2.1%	3.6%	45.0%	10.6%	14.1%	100 %

Source: NSO, 1212.mn

Additional indicators to measure labor supply

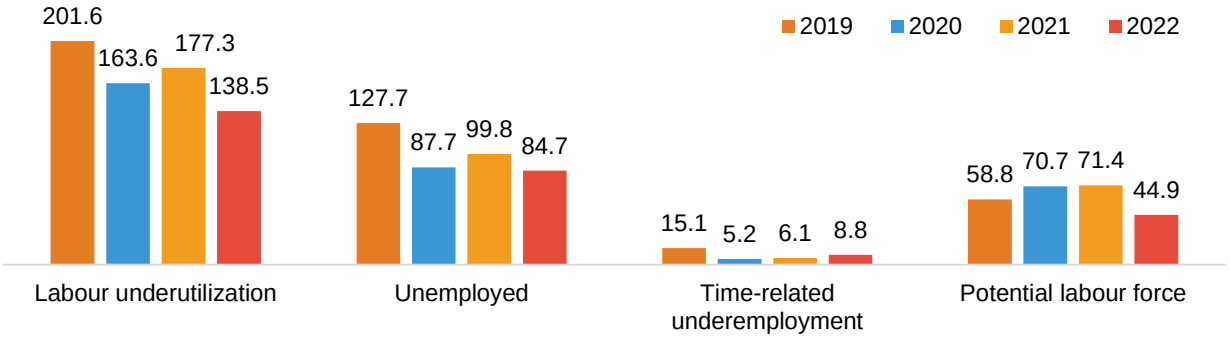
In recent years, it has become evident that traditional measures such as the number of unemployed individuals and unemployment rates do not fully capture the under-utilization of the labor force. This realization prompted discussions during the 19th ILO Conference in 2013, leading to updates in the International Definition and Methodology of Labor Statistics (1982). Consequently, new indicators, including labor under-utilization and its extent, were introduced to provide a broader perspective on labor market dynamics beyond the traditional focus on unemployment.

Since 2019, our country has been actively calculating and disseminating indicators of labor under-utilization. This shift aims to establish a more comprehensive baseline dataset, allowing for a fuller representation of individuals whose employment needs are not being met. By incorporating individuals working part-time and those seeking additional work into the assessment, policymakers can better target policies and programs to address labor market challenges effectively.

As of 2021, labor under-utilization stood at 177.3 thousand at the national level, comprising 99.8 thousand (56.3%) unemployed individuals, 71.4 thousand (40.3%) potential labor force participants, and 6.1 thousand (3.4%) part-time workers. However, by 2022, labor under-utilization had decreased by 21.9% to 138,500. This decline was driven by reductions in the number of unemployed individuals by 15.1% to 84.7 thousand and potential labor force participants by 37.1% to 44.9 thousand. Conversely, the number of part-time workers depending on time increased by 45.0% to 8.8 thousand.

Overall, labor under-utilization decreased to 138.5 thousand in 2022, representing a decline of 63.1 thousand (31.3%) from 2019, 25.1 thousand (15.3%) from 2020, and 38.8 thousand (21.9%) from 2021 at the national level. The reduction was primarily attributed to a decrease in the potential labor force by 26.5 thousand (37.1%).

Figure 10: Labor under-utilization indicators, thousand people

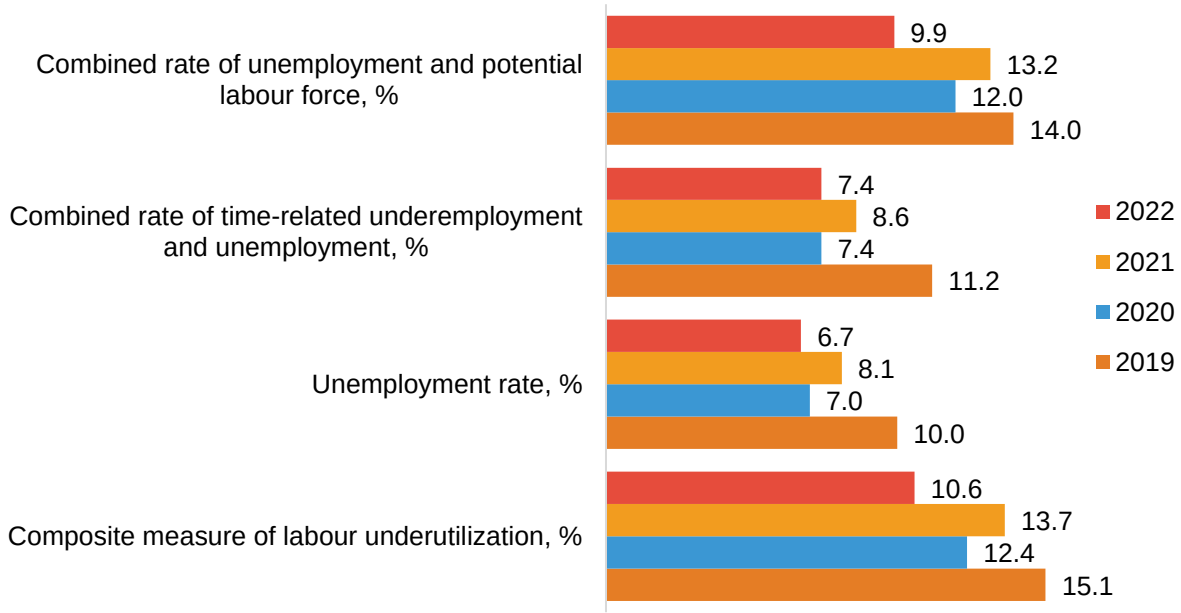


Source: NSO, 1212.mn

In 2022, the labor under-utilization rate decreased by 3.1% compared to the previous year, reaching 10.6%. The overall rate of the potential labor force and unemployed individuals also decreased by 3.3% to 9.9%, while the combined rate of under-employment and unemployment depending on time decreased by 1.2% to 7.4%. At the national level, the unemployment rate dropped by 1.4% to 6.7%.

As of 2022, the labor force experienced an increase of 39.8 thousand (3.3%) compared to the previous year. Simultaneously, the number of unemployed individuals decreased by 15.0 thousand (15.1%) to 84.7 thousand, while the potential labor force, representing individuals outside the labor force, decreased by 26.5 thousand (37.1%) to 44.9 thousand. This reduction significantly contributed to the overall decrease in labor under-utilization.

Figure 11: Labor under-utilization rates, percentage, by *quarter*



2.2 Employment service conditions

Number of registered unemployed

According to the statistics, the number of registered unemployed individuals has shown a continuous decline from 2017 to 2022. Over the past five years, the highest number of registered unemployed individuals was recorded in January 2017, with approximately 35,000 people registered. Subsequently, this number steadily decreased and reached its lowest level of 14,000 individuals in December 2022. Notably, there has been a recurring pattern of a dramatic increase in the number of registered unemployed individuals in December of each year.

Table 4: Number of registered unemployed, by the end of months (2017-2022)

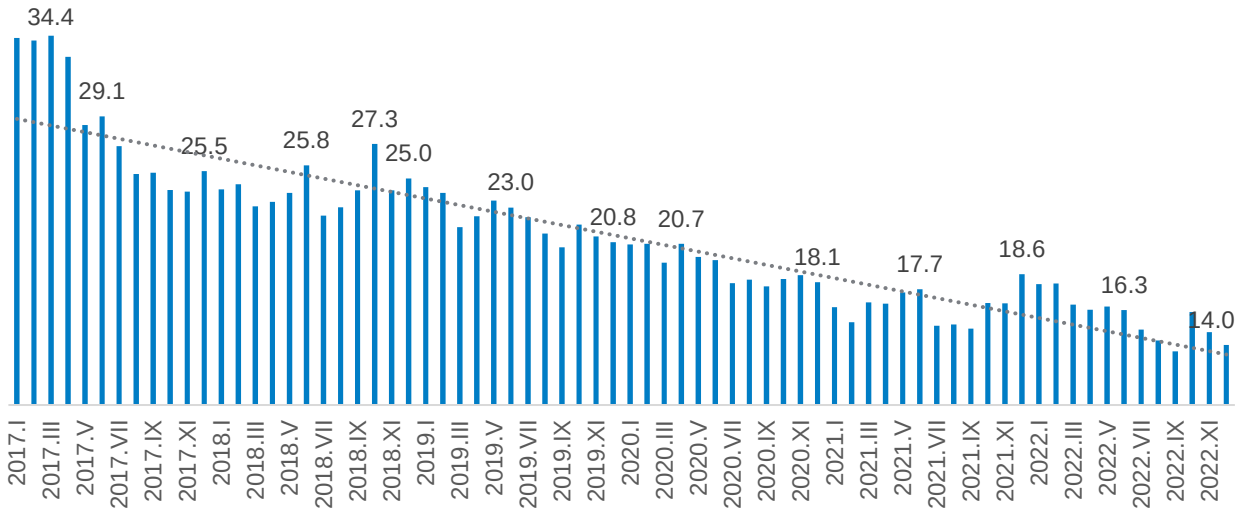


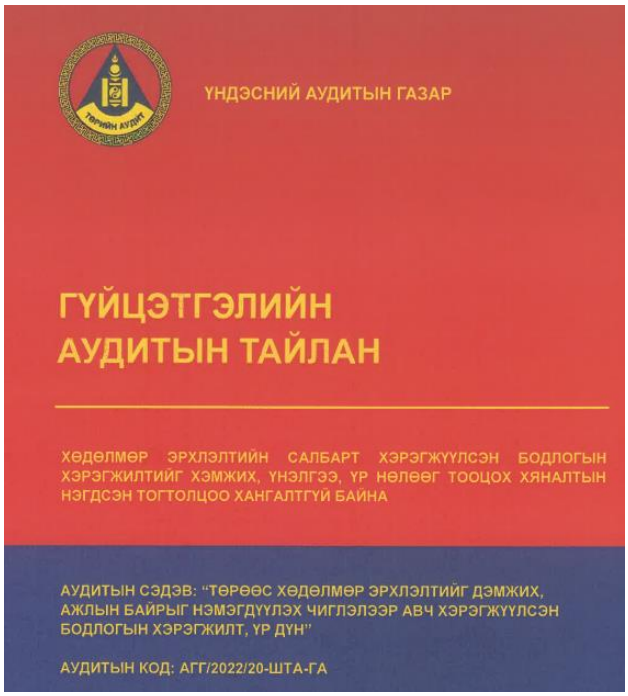
Figure 12: Number of unemployed increased in the current month, thousand people

	2017 он	2018 он	2019 он	2020 он	2021 он	2022 он
I	7.6	6.5	5.7	6.3	4.5	5.2
II	6.3	5.8	5.1	4.5	3.6	4.3
III	4.8	5.8	5.4	4.4	5.7	5.3
IV	7.2	8.3	7.0	7.7	3.6	4.5
V	6.8	8.3	7.2	6.1	5.4	5.4
VI	6.9	8.8	9.1	5.6	7.6	8.7
VII	6.3	4.8	6.3	5.2	3.5	3.6
VIII	4.7	7.3	5.7	4.9	5.3	4.7
IX	7.8	9.3	7.3	4.7	6.5	6.4
X	10.4	11.0	10.2	6.5	6.8	7.5
XI	12.7	5.9	7.9	6.4	6.8	4.9
XII	11.7	11.8	10.1	5.8	7.2	7.0

Source: General Agency for Labor Welfare Services

The report from the National Audit Office has highlighted several breaches and deficiencies in the financial support data provided under the employment fund programs. As a result, it is imperative to focus on enhancing the statistics related to the fund's operations and to bolster the benefits of the program. Addressing these issues will not only ensure greater transparency and

accountability but also contribute to the effectiveness and efficiency of the employment fund initiatives.



According to the findings of the National Audit Office, the inspection of financial support provided within the framework of the Employment Support Fund's programs revealed the following violations and deficiencies:

- In the database entry for 3,504 financial support contracts, phone numbers were omitted.
- The same phone number was repeated 2-55 times in the data of 643 financial support contracts.
- Personal ID numbers were duplicated, indicating that 98 customers received financial support more than twice.
- Personal IDs of 8 customer individuals and entities were not registered.

These breaches highlight several concerning issues, including instances where additional support is provided without prior support being repaid, as well as instances of unregistered personal IDs and repeated phone numbers. Such occurrences may suggest a lack of accountability among officials or the potential provision of financial support to close acquaintances.

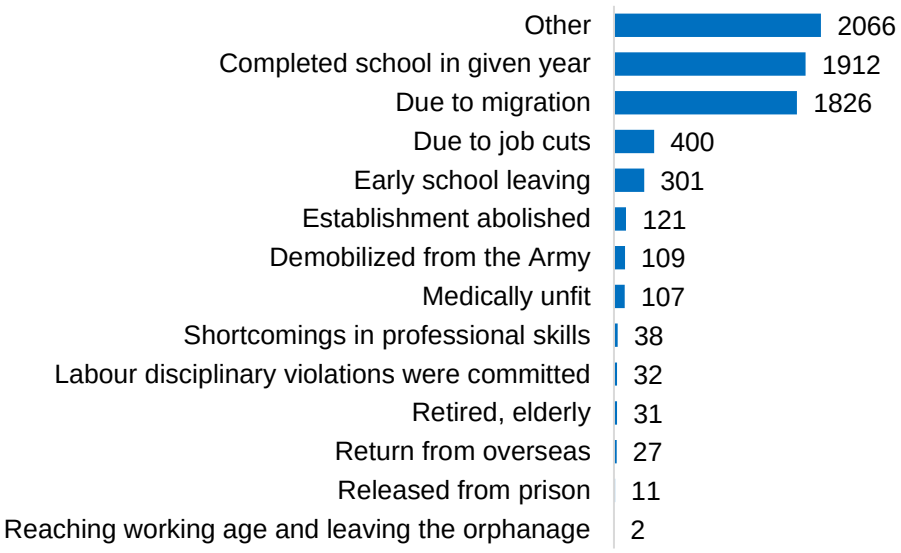
It's essential to recognize that evaluating the implementation and outcomes of employment projects solely based on quantitative metrics is insufficient. Currently, the General Agency for Labor Welfare Services primarily relies on integrating Excel data received from Labor Welfare Service Departments across aimags, soums, and districts. This data typically focuses on metrics such as the number of project participants, expenditure, and the number of individuals who secured employment.

However, the absence of a mechanism to track citizens provided with jobs poses a significant challenge. Without this tracking mechanism, it remains unclear whether project participants obtained permanent, temporary, or informal employment. Consequently, accurately assessing the effectiveness of these projects becomes difficult, if not impossible.

Another crucial employment service statistic pertains to the reasons why unemployed individuals are seeking jobs. Between 2017 and 2022, the percentage of registered unemployed individuals who found employment at the beginning of the month ranged from 1.9% (in February 2021) to 26.7% (in November 2017). Additionally, the percentage of unemployed individuals who were removed from the register due to employment during the same month varied from 6.7% (in February 2021) to 55.8% (in October 2018).

However, it is essential to conduct a detailed analysis to understand why a significant portion falls under the category of "other." This analysis can provide valuable insights into the diverse factors influencing unemployment and job-seeking behaviors, thereby informing more targeted and effective employment policies and programs.

Figure 13: Number of unemployed increased in the current month, by reasons (December 2022)



Source: General Agency for Labor Welfare Services

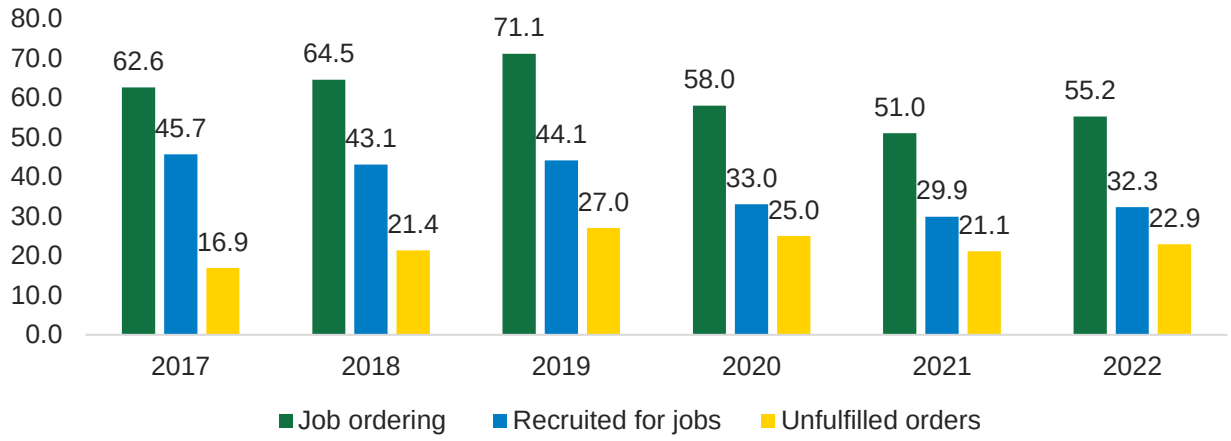
Job order performance

Between 2017 and 2022, an average of 22.6 thousand jobs per year, totaling 134.3 thousand jobs during this 6-year period, remained unfilled. While job order performance stood at 73.0% in 2017, it decreased to 58.5% in 2022.

By economic sectors, there were 55.9 thousand unfulfilled job orders in other service activities, accounting for 41.6% of the total. This suggests potential areas for improvement:

- Addressing poor knowledge about classification and enhancing the quality of information by focusing on entering job orders based on the main fields of activities of the entity.
- Classifying construction, mining, and agriculture jobs as temporary and seasonal works.
- Categorizing manufacturing, health, and education jobs as full-time or permanent positions.

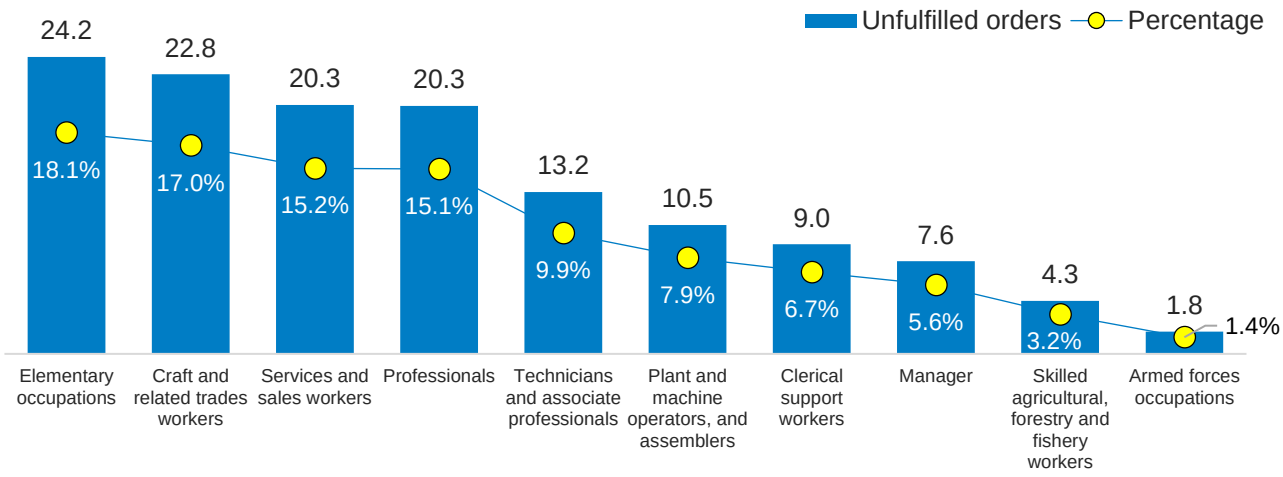
Figure 14: Job order performance



Source: General Agency for Labor Welfare Services

Between 2017 and 2022, there were 20,300 to 24,200 unfulfilled orders in workplaces categorized as Elementary occupations (M9), Craft and related trades workers and (M7), Service and sales workers (M5), and Professionals (M2), accounting for 15.1% to 18.1% of all unfulfilled demand. It is essential to classify job orders and employed citizens according to the type of jobs, whether permanent or temporary. Additionally, integrating the labor welfare service agencies, departments, employment agencies, and private labor exchanges of the capital city, aimags, and districts into a unified employment service performance framework is necessary. This integration should include analysis, implementation of necessary measures, and mandates for vocational education and training organizations, Technical and Vocational Education and Training (TVET) institutions, in aimags, the capital city, and districts to analyze and act in accordance with labor market demands.

Figure 15: Number of unfulfilled orders (thousand), share (%), by main occupational groups, 2017-2022



Source: General Agency for Labor Welfare Services

2.3 International trends of labor market

In formulating Mongolia's labor market policy, besides conducting a thorough analysis of the present circumstances, it's crucial to consider global trends to draw comprehensive conclusions. Thus, the consulting service team examined the "World Employment and Social Outlook Trends 2023" report released by the International Labor Organization and reached the following conclusions.

Labor market is facing a big challenge.

- The international labor market state worsened significantly in 2022: Geopolitical issues, post-pandemic

crises, supply chain disruptions, and rising prices have created Stagflation in the economy and labor market.

- In these difficult circumstances, decent employment is lost worldwide and social inequality is deepening.
- Due to the impact of the pandemic, the number of poor people has increased, despite the fact that informal employment and employment are still in use. According to the report, 2 billion people in the world work in the informal sector, which is equal to 58% of all workers. But in our country, as of 2022, 500.3 thousand people are working in the informal sector, which is equal to 42.4% of all workers. In the non-agricultural sector, 215,400 people work in the informal sector (18.2%).

Labor market challenges are deepening the social inequality.

- There are 473 million unemployed people worldwide, and 245.7 thousand unemployed people in Mongolia. The unemployment rate is 12.3% on average in the world, while ours is 17.2%, which is slightly higher than the global average. Also, considering the potential labor force, there are 161,000 citizens in our country.

Many crises are hindering the employment growth.

- The continued impact of the pandemic, cost of living and geopolitical crises weigh heavily on the labor market outlook.
- In addition to these recent challenges, the need for long-term structural changes in the international labor market is strongly felt: climate change, declining fertility and aging.
- The interaction of macroeconomic factors, long-run trends, and institutional arrangements affect employment growth differently across countries' income levels. In low- and lower-middle-income countries, low social protection coverage forces many workers into the informal sector, where they cannot stop working, but because of the economic slowdown.

Employment growth is expected to slow significantly.

- Global employment growth is expected to increase from 2.3% in 2022 to 1.0% in 2023.
- Slower employment growth means that the problems caused by the pandemic crisis continue over the next two years.
- The outlook for the labor market in 2023 varies across regions. Annual growth in employment starts in Asia and the Pacific is expected to be 1%, while Europe and Central Asia are expected to decline.
- The decline in international labor supply is likely to continue, and developed countries in particular will experience significant labor shortages.
- In addition to the slowdown in employment growth, the lack of skilled labor resources poses a risk to certain countries and sectors. The lack of youth labor force participation and quality of education over the past 10 years will negatively affect the quality of the labor force today and in the future.

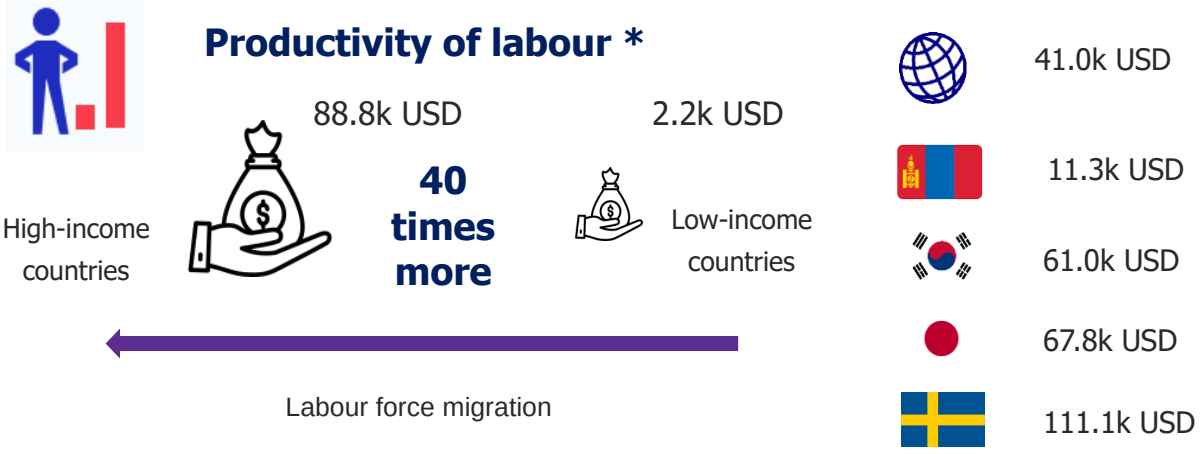
Paying attention to the quality of workplace is vital.

- In addition to the lack of jobs, the quality of jobs remains a major issue.
- Inflation has a strong impact on real income distribution.
- The influence of international supply chains is spreading strongly in low- and middle-income countries.

Productivity growth remains a vital issue.

- Slowing long-term productivity growth in developed countries is increasingly occurring in developing countries as well. Productivity growth is a key factor in solving many of today's problems related to purchasing power, well-being, and sustainability.
- Not only has productivity growth slowed down, but the benefits of that growth are not equally distributed.
- Despite the progress of digital economy technology innovation, its benefits cannot be widely used.
- Decreased investment due to high economic uncertainty negatively affected productivity growth.
- Poor labor market conditions and the growth of informal economy reduce incentives to invest in productivity.
- The average labor productivity in Mongolia is 3.6 times lower than the world average and 5.4 times lower than the Republic of Korea, see the figure below. Therefore, increasing productivity remains an important issue for us.
- 6.4% of all workers are below the poverty line at teh international level, that is, workers who consume less than 1.9 USD per day. As of 2020, there are 260,500 workers in Mongolia, which is the highest figure in the world. Therefore, it is necessary to increase productivity and increase skills.

Figure 16: Labor productivity, internationally and in Mongolia



* GDP per employee (at constant prices of 2015)

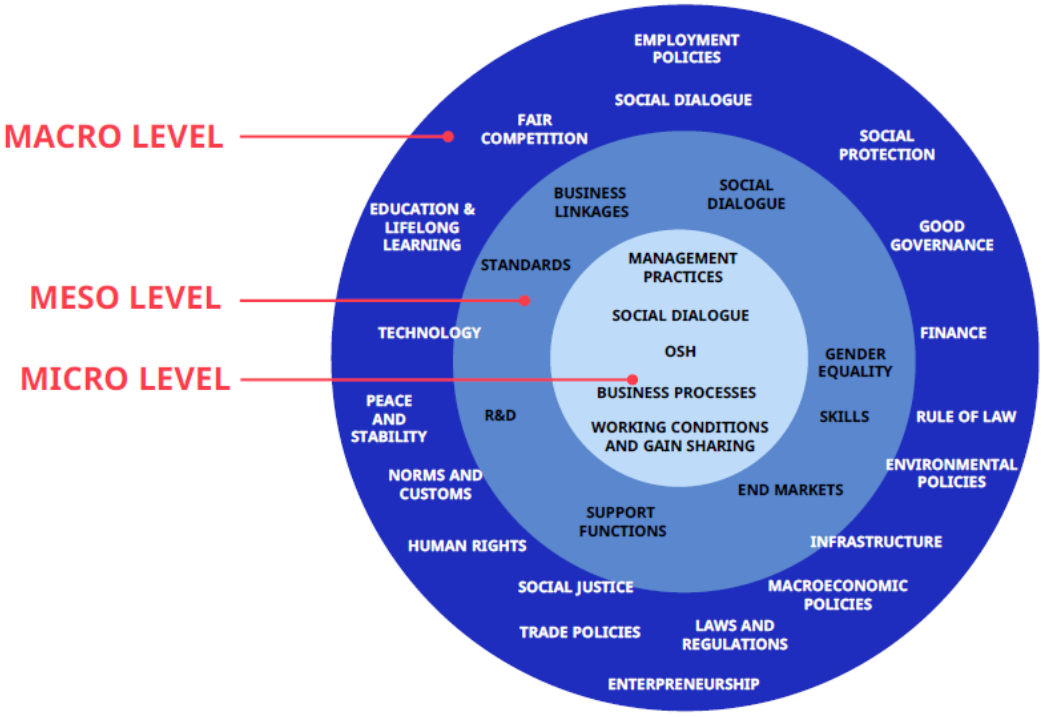
The international outlook on employment and social issues highlights two key concerns:

Desire but Dilemma: Governments and businesses are striving to stimulate economic growth, business activities, and employment opportunities. However, they are encountering numerous challenges, including the aftermath of the pandemic, geopolitical tensions, supply chain disruptions, and escalating prices. Despite the aspirations for economic and business advancement, these risks and challenges often result in the loss of decent employment, the creation of employment inequality, and a decline in labor force participation rates and willingness to work.

Shift in Mindset – Reforming Policies for Productivity Enhancement: Ensuring sustained productivity growth is of paramount importance. To achieve this, comprehensive policy reforms are required at the macro, meso, and micro levels. The International Labor Organization (ILO) recommends focusing on several key areas. At the macro level, attention should be given to

employment policies, governance, infrastructure, macroeconomic policies, technology integration, human rights, and lifelong education. At the meso level, emphasis should be placed on standards implementation, collaboration with the private sector, gender equality, and skill development initiatives. Moreover, prioritizing micro-level practices such as enhancing business processes and improving working environments can also be highly effective.

Figure 17: Productivity ecosystem[1]



[1] ILO policy document, 341st Session, Geneva, March 2021, GB.341/POL/2

CHAPTER 3

MID-TERM FORECASTING OF GROSS DOMESTIC PRODUCT

3. MID-TERM FORECASTING OF GROSS DOMESTIC PRODUCT

3.1 GDP forecasting of Mongolia

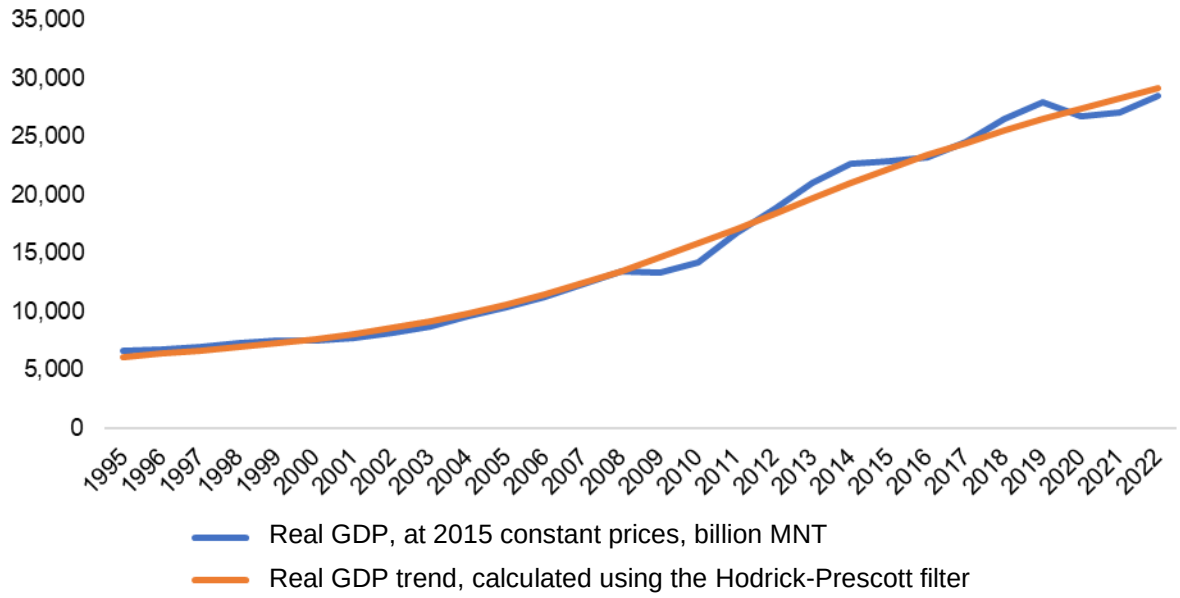
Real GDP data from 1995 to 2022, adjusted to 2015 par value, served as the basis for projecting Mongolia's GDP up to 2035. To forecast the GDP outlook, cyclical effects were eliminated, and the underlying trend was isolated using the Hodrick-Prescott filter (HP filter). Future values of this trend were estimated using linear, quadratic, and mixed trend functions, and predictions were derived accordingly. Mongolia's real GDP experienced declines due to the global economic crisis of 2008-2009 and the Covid-19 pandemic in 2020-2021. When projecting the long-term trend, the standard approach involves forecasting based on the fundamental growth trajectory, assuming the absence of such intermediate shocks.

Table 5: Real GDP and its trend value, at 2015 constant prices, in billion MNT

Year	*The GDP value for previous years*			
	Nominal GDP, at current prices, billion MNT	***Real GDP, at 2015 constant prices, billion MNT***	***GDP deflator***	***Real GDP trend, calculated using the Hodrick-Prescott filter***
1995	651.5	6,604.5	0.10	6,106.8
1996	738.0	6,752.1	0.11	6,389.3
1997	932.9	7,015.2	0.13	6,676.9
1998	945.5	7,249.5	0.13	6,978.0
1999	1,080.5	7,472.1	0.14	7,304.8
2000	1,224.1	7,557.7	0.16	7,671.7
2001	1,391.9	7,780.9	0.18	8,095.4
2002	1,550.6	8,149.2	0.19	8,590.9
2003	1,829.1	8,720.0	0.21	9,170.4
2004	2,361.2	9,646.5	0.24	9,841.5
2005	3,041.4	10,346.3	0.29	10,607.5
2006	4,027.6	11,231.5	0.36	11,469.5
2007	4,956.6	12,382.5	0.40	12,426.2
2008	6,555.6	13,484.6	0.49	13,473.7
2009	6,590.6	13,313.5	0.50	14,607.9
2010	9,756.6	14,244.6	0.68	15,824.7
2011	13,173.8	16,707.6	0.79	17,107.0
2012	16,688.4	18,766.0	0.89	18,421.9
2013	19,174.2	20,952.0	0.92	19,732.7
2014	22,227.1	22,604.1	0.98	21,006.0
2015	22,894.8	22,894.8	1.00	22,220.4
2016	23,931.3	23,235.9	1.03	23,370.9
2017	28,010.7	24,545.6	1.14	24,458.9
2018	32,582.6	26,446.7	1.23	25,484.5
2019	37,839.2	27,928.3	1.35	26,449.0
2020	37,453.3	26,655.4	1.41	27,362.8
2021	43,555.5	27,091.7	1.61	28,251.4
2022	53,851.5	28,455.1	1.89	29,133.2

The graphical representation illustrates both the real GDP trend and the actual values over the specified period.

Figure 18: Real GDP and its trend value



The table below displays the data generated by the econometric models of the GDP trend isolated through the Hodrick-Prescott filter.

Table 6: Econometric models of real GDP trends

Type of econometric model	*Linear Regression Model*	*Quadratic model*	*Exponential model*
Dependent variable	$rgdp_t$	$rgdp_t$	$\log(rgdp_t)$
Constant term (intercept)	3076.8^{***}	5412.2^{***}	8.67^{***}
t	931.44^{***}	392.5^{***}	0.064^{***}
t^2		19.96^{***}	
R^2	0.97	0.993	0.99
AR^2	0.97	0.992	0.99
Standard deviation of residuals	1375.88	674.29	0.052
Akaike's Information Criterion (AIC)	17.36	15.96	-3.02
Schwarz criterion / Bayesian Information Criterion (BIC)	17.45	16.10	-2.92

Where *t* represents the time index or the year number for which the information is utilized. Among the models that can be directly compared, the quadratic model is deemed more suitable than the linear and mixed function estimations, based on the Akaike and Schwartz tests. The forecast values for the interval of 2023-2035 generated by these three alternative models are depicted in the figure below.

Figure 19: Forecasted real GDP values until 2035, based on 2015 prices, in billion MNT

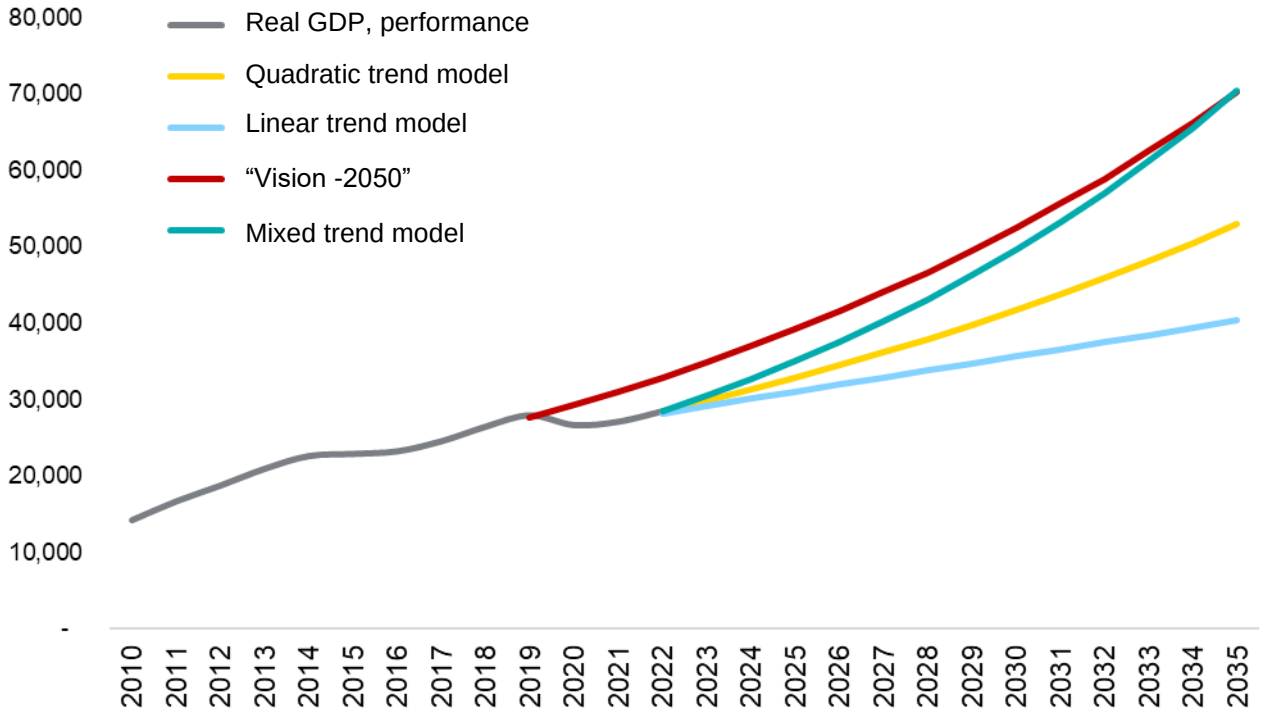


Table 7: Real GDP growth rates and forecasted values until 2035, in billion MNT (based on 2015 prices)

Year	Mixed model	Quadratic model	Linear Regression Model	Vision -2050	Mixed model	Quadratic model	Linear Regression Model	Vision-2050
2023	7.2%	4.9%	3.3%	6.0%	30,492	29,852	29,157	34,909
2024	7.2%	4.9%	3.2%	6.0%	32,679	31,317	30,088	37,003
2025	7.2%	4.9%	3.1%	6.0%	35,026	32,854	31,020	39,223
2026	7.2%	4.9%	3.0%	6.0%	37,546	34,466	31,951	41,577
2027	7.2%	4.9%	2.9%	6.0%	40,251	36,158	32,883	44,071
2028	7.2%	4.9%	2.8%	6.0%	43,155	37,933	33,814	46,715
2029	7.2%	4.9%	2.8%	6.0%	46,274	39,795	34,746	49,518
2030	7.2%	4.9%	2.7%	6.0%	49,624	41,748	35,677	52,489
2031	7.2%	4.9%	2.6%	6.0%	53,220	43,797	36,609	55,639
2032	7.3%	4.9%	2.5%	6.0%	57,083	45,946	37,540	58,977
2033	7.3%	4.9%	2.5%	6.0%	61,233	48,202	38,471	62,516
2034	7.3%	4.9%	2.4%	6.0%	65,690	50,567	39,403	66,267
2035	7.3%	4.9%	2.4%	6.0%	70,478	53,049	40,334	70,243

Regarding quadratic trends, based on the data of the last 20 years, Mongolia's economy is projected to grow by an average of 4.9% per year. By 2035, the GDP is forecasted to increase to

53,049 billion MNT, or 1.86 times compared to 2022, at constant 2015 prices. As for the mixed trend, the economy is expected to grow by an average of 7.2% until 2035, with the GDP reaching 70,478 billion MNT at 2015 prices, or 2.48 times compared to 2022.

Among these calculations, the quadratic function prediction appears to be the most probable, yielding a GDP of 6.3 billion MNT in 2025, 10.7 billion MNT in 2030, and 17.2 billion MNT in 2035. This gap represents the cumulative effect of the growth slowdown caused by the Covid pandemic.

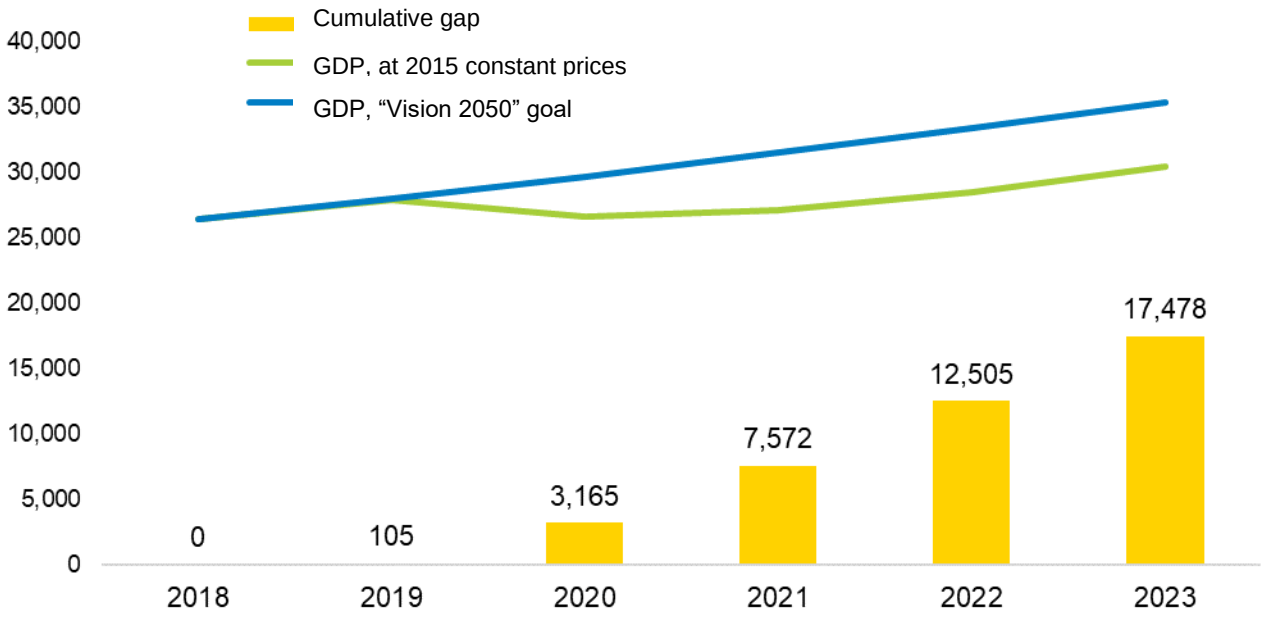
If growth follows the quadratic trend, it will fall short of the Vision-2050 target. However, if the economy grows according to the assumptions of the pure exponential trend model, the real GDP is projected to reach the Vision-2050 level by 2032.

To achieve the goals of Vision-2050 by 2035, it is essential to meet the growth estimated by the mixed trend model, i.e., 7.2% annual growth. The mixed growth rate was calculated by considering an 80:20 ratio of exponential and quadratic function predictions, providing an optimistic estimate.

In Vision-2050 calculations, the annual economic growth rate post-2018 was targeted at 6%, with the annual exchange rate of the US dollar expected to increase by an average of 2%. By these estimates, GDP was projected to reach 23.9 billion USD in 2025 and 47.6 billion USD in 2030. Additionally, the inflation rate was anticipated to be 6% in both 2025 and 2030, with GDP per capita calculated at the respective exchange rates, amounting to 4,009 USD in 2018, 6,520 USD in 2025, and 12,054 USD in 2030.

However, due to the economic slowdown resulting from the Covid-19 pandemic impacts, the economy contracted by 4.6% in 2020, followed by growth of 1.6% in 2021 and 5% in 2022. Failing to achieve the target 6% growth in these years resulted in a cumulative difference of about 17.5 trillion MNT at constant 2015 prices between 2020 and 2023. Therefore, to meet the 2030 goal, it is imperative to intensify economic growth and maintain it at a minimum of 7%.

Figure 20: Comparison of "Vision-2050" goal and real performance, cumulative *gap*, billion MNT



To assess Mongolia's GDP production based on factor participation, the Cobb-Douglas production function was examined within a neutral scientific and technologically advanced scenario.

When evaluating production in the economy from a supply perspective, it is influenced by the primary factors of production: capital and labor, along with productivity or technological progress. Consequently, in the long run, the production function is conceptualized as follows.

$$Y_t = A \cdot K_t^{\alpha} L_t^{1-\alpha} e^{\gamma t}$$

Where Y_t – Real GDP, K_t^{α} -Capital or fixed assets, $L_t^{1-\alpha}$ -number of labor force, t – time index, γ-percentage of total productivity growth

Expressed as a percentage of output and factor growth:

$$g_Y = \gamma \cdot 100 + \alpha \cdot g_K + (1-\alpha) \cdot g_L$$

Where g_Y- percentage of GDP growth, $\gamma \cdot 100$- percentage of total productivity growth, g_K-percentage of capital growth, g_L- percentage of labor or workers growth

The Cobb-Douglas production function with constant returns to expansion with scientific progress was estimated by using the macroeconomic data between 2000-2022:

Table 8: Estimation of the Cobb-Douglas production function

Dependent variable	$Ln\left(\frac{Y}{L}\right)$	1
Constant term (intercept)	$Ln(A)$	0.756***
Independent variable	$ln\left(\frac{K}{L}\right)$	0.488***
Productivity parameter	γ	0.004
Coefficient of determination	R^2	0.98
Durbin-Watson statistic	$DW\ stat$	0.77

In this case, the production function of our country is as follows.

$$Y_t = 2.13 \cdot K_t^{0.488} L_t^{0.512} e^{0.004t}$$

Converting this to percentage growth is

$$g_Y = 0.4 + 0.488 \cdot g_K + 0.512 \cdot g_L$$

In 2000-2022, average capital growth was $g_K = 11.6\%$, and average worker growth was $g_L = 1.7\%$. Based on these growth percentages, the average growth rate of our country's economy is:

$$g_Y = 0.4 + 0.488 \cdot 11.6 + 0.512 \cdot 1.7 = 6.93\%$$

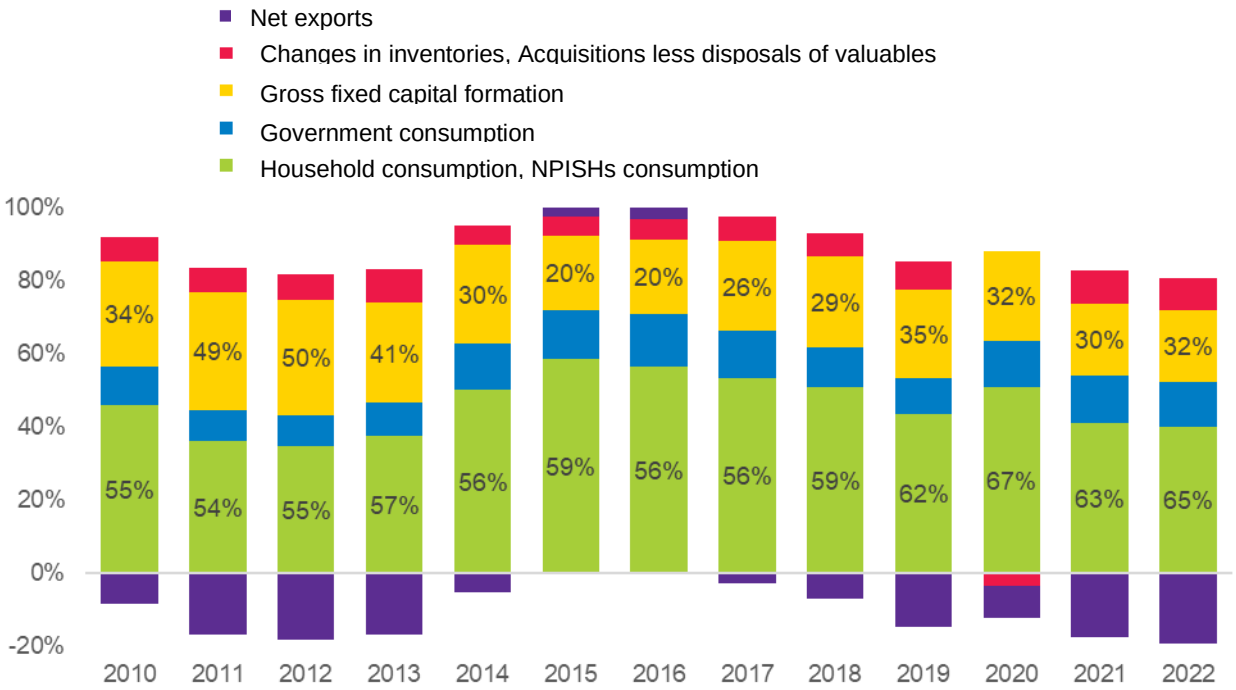
Certainly, it's crucial to acknowledge that this growth period coincided with the commissioning of the Oyutolgoi open-pit mine, vigorous infrastructure development, notably road construction, and extensive new construction projects. Hence, achieving a growth rate of 7% necessitates financing and executing investment initiatives of similar magnitude.

Moreover, from the assessment of the production function, it's apparent that total production growth was statistically insignificant. Economic growth relied solely on the augmentation of factor quantities. In essence, our economy's growth is intensive, driven solely by scale expansion.

Investments required for economic growth

The driving forces behind economic growth are savings, investment, the expansion and enhancement of the labor force resulting from population growth, and technological progress. Below, the relationship between our economic growth and investment in the current year is depicted. Additionally, the structure of GDP categorized by final use or expenditure is illustrated.
The portion of GDP attributed to consumption by private and public institutions remains notably stable. However, the shares allocated to investment and net exports fluctuate due to economic conditions, macroeconomic sector variations, and product structure alterations. Particularly for a country like ours, which primarily sources its investment products from foreign countries, investment volumes tend to surge during years of robust economic growth, often accompanied by substantial foreign trade deficits, manifested through increased imports.

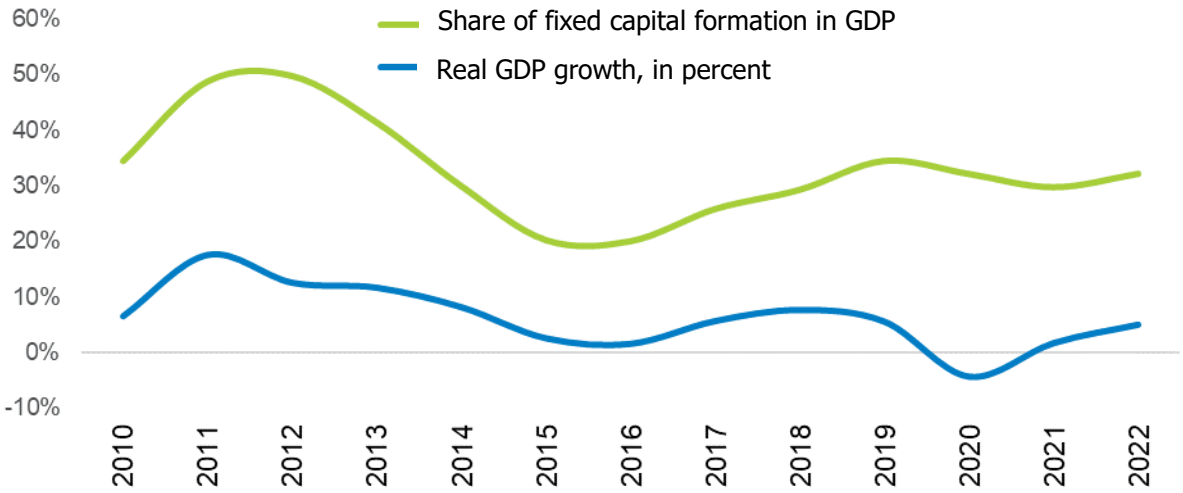
Figure 21: Components of GDP expenditure , as percentage of GDP, at constant prices



The figure below illustrates the correlation between the proportion of total capital accumulation or investment in GDP and the economic growth of the respective year. For instance, during 2011-2012, investments in the Oyutolgoi open-pit mining project resulted in the country's investment reaching approximately 50% of GDP. Consequently, GDP growth during this period ranged between 12.5% and 17.5%.
However, in 2015-2016, a decline in foreign investment inflows coupled with a decrease in world market prices of mineral products led to the investment share in GDP dropping to around 20%. Consequently, GDP growth during this period hovered between 1.5% and 2.5%.

In 2020, investments aimed at achieving approximately 5% annual growth were made. However, the year proved to be anomalous, with negative GDP growth due to the partial or complete shutdown of factories and services triggered by the impact of the Covid-19 pandemic.

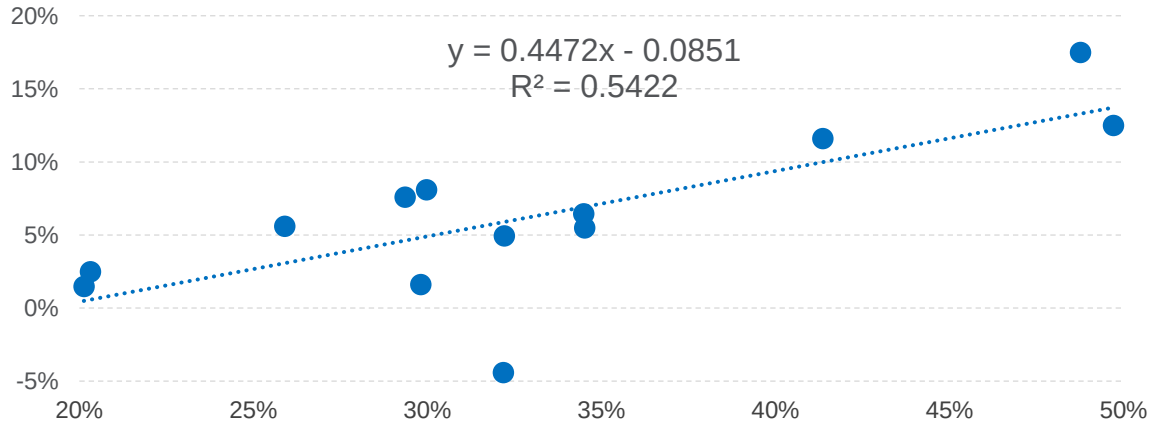
Figure 22: Share of investments in GDP and economic growth



Source: NSO, 1212.mn

The GDP trend forecast suggests that, in the middle or most probable scenario, the economy requires a growth rate of 4.9%, whereas in the upper scenario, the economy requires a growth rate of 7.3%. Using the regression results provided below, the required amount of investment for our country to achieve these growth rates was calculated.

Figure 23: Correlation of investment and economic growth

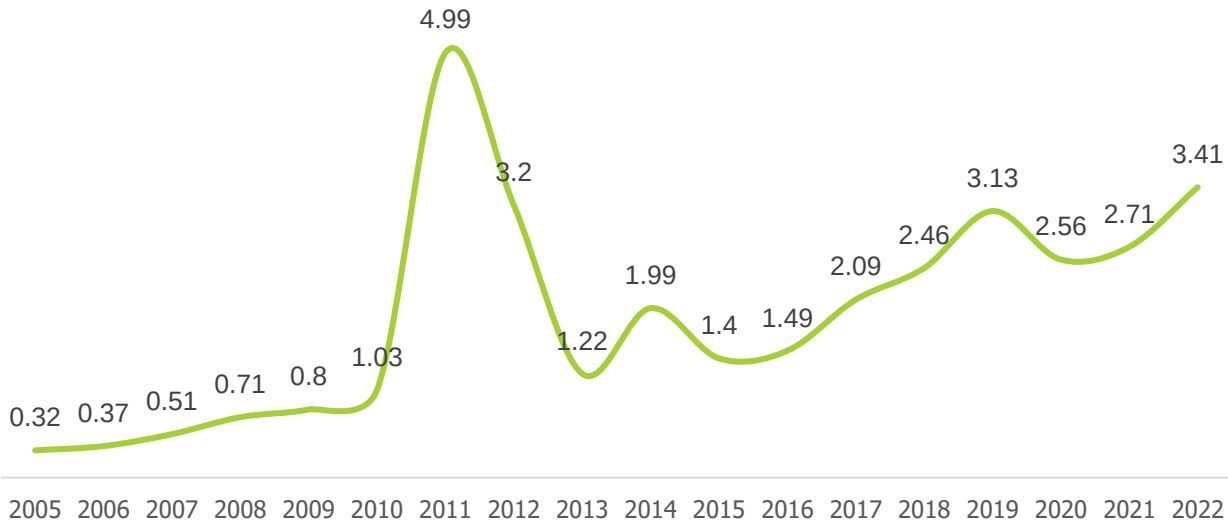


As estimated in the regression equation depicted in the figure, approximately 30% of real GDP is required for achieving economic growth of 4.9%, while about 35% is needed to attain a growth rate of 7.3%. Comparing this to the estimated GDP in both scenarios, expressed in USD, yields the following results: To ensure an annual growth of 4.9%, an investment of 5.0 billion USD is necessary in 2025, and 6.2 billion USD is required to ensure a growth rate of 7.3%.

Table 9: Required investment, by two scenarios

Year	Investment Required to Achieve 4.9% Growth, in 2015 USD (Billion USD)	Investment Required to Achieve 7.3% Growth, in 2015 USD (Billion USD)
2023	4.5	5.4
2024	4.8	5.8
2025	5.0	6.2
2026	5.2	6.7
2027	5.5	7.1
2028	5.8	7.7
2029	6.1	8.2
2030	6.4	8.8
2031	6.7	9.5
2032	7.0	10.1
2033	7.3	10.9
2034	7.7	11.7
2035	8.1	12.5

Figure 24: Foreign direct investment inflow, by annual rate, billion USD



Source: NSO, 1212.mn

Comparing the figure above and the table, it is imperative to match the total investment in 2024 with the level of Oyutolgoi investment made in 2011. If we consider the investment to GDP ratio of about 30% seen in 2018, coupled with economic growth of approximately 7%, achieving the target of mixed growth seems feasible if foreign direct investment (FDI) reaches at least 2.5 billion USD. However, to meet the 2035 goal, it's likely that this amount will need to increase by 5-7% in the future.

3.2 Forecasting of main indicators of macro economy

Based on the quadratic and mixed trend for nominal and real GDP, USD exchange rate, and deflator inflation values described in the previous subsection, the table below presents the GDP forecast in dollars. It includes values for nominal and real GDP, as well as the deflator and deflator calculated by the quadratic trend.

Table 10: Forecasting of GDP calculated by quadratic trend

Year	Nominal GDP, at current prices, billion MNT	Real GDP, at 2015 constant prices, billion MNT	Economic growth rate, percentage compared to previous year	GDP deflator, (based on 2015 prices)	Inflation measured by GDP deflator
2023	64918.9	29851.7	5.0%	2.17	14.9%
2024	72729.4	31316.9	4.9%	2.32	6.8%
2025	81321.6	32854.0	4.9%	2.48	6.6%
2026	90756.3	34466.5	4.9%	2.63	6.4%
2027	101096.9	36158.1	4.9%	2.80	6.2%
2028	112408.1	37932.8	4.9%	2.96	6.0%
2029	124755.9	39794.6	4.9%	3.13	5.8%
2030	138207.3	41747.8	4.9%	3.31	5.6%
2031	152829.4	43796.8	4.9%	3.49	5.4%
2032	168689.0	45946.4	4.9%	3.67	5.2%
2033	185851.8	48201.6	4.9%	3.86	5.0%
2034	204381.7	50567.4	4.9%	4.04	4.8%
2035	224340.1	53049.3	4.9%	4.23	4.6%

The table below presents the nominal and real GDP calculated by the mixed trend, along with the corresponding deflator and estimated inflation values.

Table 11: Forecasting of GDP calculated by mixed trend

Year	Nominal GDP, at current prices, billion MNT	Real GDP, at 2015 constant prices, billion MNT	Economic growth rate, percentage compared to previous year	GDP deflator, (based on 2015 prices)	Inflation measured by GDP deflator
2023	66311.8	30492.2	7.2%	2.17	14.9%
2024	75892.2	32678.7	7.2%	2.32	6.8%
2025	86697.6	35025.9	7.2%	2.48	6.6%
2026	98864.2	37545.6	7.2%	2.63	6.4%
2027	112539.9	40250.8	7.2%	2.80	6.2%
2028	127884.3	43155.4	7.2%	2.96	6.0%
2029	145069.6	46274.3	7.2%	3.13	5.8%
2030	164280.1	49623.5	7.2%	3.31	5.6%
2031	185712.9	53220.4	7.2%	3.49	5.4%
2032	209577.7	57083.5	7.3%	3.67	5.2%

2033	236096.3	61232.7	7.3%	3.86	5.0%
2034	265502.7	65689.7	7.3%	4.04	4.8%
2035	298042.3	70477.5	7.3%	4.23	4.6%

If the economy manages to grow by 4.9% annually according to the quadratic trend model, the nominal GDP is projected to reach 224,340 billion MNT in 2035, with real GDP reaching 53,049 billion MNT. When converted using the USD exchange rate calculated in the mixed scenario, nominal GDP in 2035 would reach 41,568 million USD, and real GDP would reach 26,915 million USD.

In the case of the economy growing by 7.2-7.3% annually as per the mixed trend model, the nominal GDP is forecasted to reach 298,042 billion MNT by 2035, with real GDP reaching 70,478 billion MNT. Upon conversion using the USD exchange rate calculated in the mixed scenario, nominal GDP in 2035 would amount to 55,224 million USD, while real GDP would stand at 35,757 million USD.

Table 12: GDP forecasting in USD

		Quadratic trend model		Mixed trend model	
Year	**USD to MNT exchange rate**	**Nominal GDP, at current prices, (million USDs)**	**Real GDP, at 2015 constant, (million USDs)**	**Nominal GDP, at current prices, (million USDs)**	**Real GDP, at 2015 constant, (million USDs)**
2023	3,410	19,037	15,146	19,446	15,470
2024	3,543	20,527	15,889	21,420	16,580
2025	3,681	22,091	16,669	23,551	17,771
2026	3,825	23,728	17,487	25,848	19,049
2027	3,974	25,440	18,345	28,319	20,422
2028	4,129	27,224	19,246	30,973	21,895
2029	4,290	29,081	20,190	33,816	23,478
2030	4,457	31,007	21,181	36,856	25,177
2031	4,631	33,000	22,221	40,101	27,002
2032	4,812	35,058	23,311	43,555	28,962
2033	4,999	37,175	24,455	47,225	31,067
2034	5,194	39,347	25,656	51,113	33,328
2035	5,397	41,568	26,915	55,224	35,757

GDP per capita calculated according to quadratic trends at annual prices based on population projections is displayed in the table below. If the economy follows the quadratic trend, GDP per capita at annual prices is projected to be 18.7 million MNT in 2023, 36.2 million MNT in 2030, and 54.8 million MNT in 2035, representing a 2.9-fold increase compared to 2023. However, within the framework of the mixed trend scenario, GDP per capita in 2035 is anticipated to rise to 72.8 million MNT, marking a 3.8-fold increase compared to 2023.

Table 13: GDP per capita forecasting, by current prices, in MNT

		Quadratic trend model		Mixed trend model	
Year	**Population, thousand**	**Nominal GDP, at**	**GDP per capita, at**	**Nominal GDP, at**	**GDP per capita, at**

	persons	current prices, (billion MNT)	current prices, (million MNT)	current prices, (billion MNT)	current prices, (million MNT)
2023	3,480	64,919	18.7	66,312	19.1
2024	3,529	72,729	20.6	75,892	21.5
2025	3,578	81,322	22.7	86,698	24.2
2026	3,627	90,756	25.0	98,864	27.3
2027	3,675	101,097	27.5	112,540	30.6
2028	3,723	112,408	30.2	127,884	34.3
2029	3,772	124,756	33.1	145,070	38.5
2030	3,822	138,207	36.2	164,280	43.0
2031	3,872	152,829	39.5	185,713	48.0
2032	3,924	168,689	43.0	209,578	53.4
2033	3,978	185,852	46.7	236,096	59.3
2034	4,035	204,382	50.7	265,503	65.8
2035	4,093	224,340	54.8	298,042	72.8

The estimated GDP per capita, calculated at annual and 2015 exchange rates based on the USD exchange rate and population projections, is presented in the table below, considering two scenarios of economic growth. If the economy follows the quadratic trend, nominal GDP per capita is projected to reach 6,174 USD in 2025, 8,114 USD in 2030, and 10,155 USD in 2035. However, real per capita GDP is expected to be 4,658 USD in 2025, 5,543 USD in 2030, and 6,576 USD in 2035.

Table 14: Forecast of GDP per capita, current prices, in USD

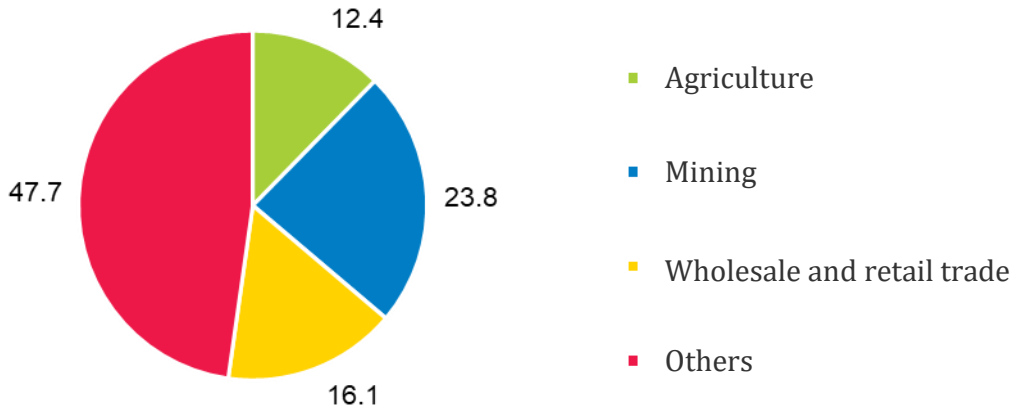
		Quadratic trend model		Mixed trend model	
Year	**Population, thousand persons**	**Nominal GDP per capita, at current prices, USD**	**Real GDP per capita, at the 2015, USD**	**Nominal GDP per capita, at current prices, USD**	**Real GDP per capita, at the 2015, USD**
2023	3,480	$5,471	$4,353	$5,588	$4,446
2024	3,529	$5,816	$4,502	$6,069	$4,698
2025	3,578	$6,174	$4,658	$6,582	$4,966
2026	3,627	$6,543	$4,822	$7,127	$5,253
2027	3,675	$6,922	$4,992	$7,706	$5,557
2028	3,723	$7,312	$5,169	$8,318	$5,880
2029	3,772	$7,709	$5,353	$8,965	$6,224
2030	3,822	$8,114	$5,543	$9,645	$6,588
2031	3,872	$8,523	$5,739	$10,357	$6,974
2032	3,924	$8,934	$5,941	$11,100	$7,381
2033	3,978	$9,345	$6,148	$11,871	$7,809
2034	4,035	$9,753	$6,359	$12,669	$8,261
2035	4,093	$10,155	$6,576	$13,492	$8,736

If the economy follows the mixed trend, nominal GDP per capita is projected to reach 6,582 USD in 2025, 9,645 USD in 2030, and 13,492 USD in 2035. However, real GDP per capita is predicted to be 4,966 USD in 2025, 6,588 USD in 2030, and 8,736 USD in 2035.

3.3 Composition of Mongolia's GDP by Industry

Mongolia's economy has maintained consistent growth since 2000, with a significant economic recovery observed from 2004 onwards, driven by rising commodity prices and increased foreign direct investment. The economic structure has been predominantly influenced by sectors such as agriculture, mining, quarrying, and trade, collectively contributing to over half of the GDP. For instance, between 2017 and 2022, agriculture accounted for an average of 12.4% of GDP, mining contributed 23.8%, and trade constituted 16.1%. This structural trend is projected to persist, with Vision 2050 anticipating that the mining sector will represent 30% or more of GDP by 2030.

Figure 25: Industrial composition of GDP, on average for 2017-2022



According to the Leontiev production model based on Mongolia's interdisciplinary balance in 2019 (with 53 net sectors), two versions of final demand were calculated:

- Version A: Based on the annual average GDP growth from 1995 to 2022, at comparable prices of 2015.
- Version B: Based on the annual average GDP growth from 2000 to 2022, at comparable prices of 2015.

Under version A, the final demand in 2035 (GDP) at comparable prices of 2015 is projected to reach 67,644 billion MNT. In version B, the final demand in 2035 (GDP) at comparable prices of 2015 is expected to grow to 71,592 billion MNT. The results of the mixed trend model and version B (70,478 and 71,592 billion MNT at comparable prices of 2015) are similar, with the mixed trend model selected as the suitable scenario.

The calculation of the added value of economic sectors (disciplinary GDP) from the forecast results of Mongolia's GDP until 2035 was conducted according to the following two principles:

1. Forecast the performance of each sector until 2035 using an exponential model, based on the 13-year data since 2010 regarding the share of sectors in Mongolia’s GDP.
2. Revise the text in line with the outcomes of economic calculations from Mongolia's Vision-2050 long-term policy document.

The assignment required calculating disciplinary added value according to the classification of all types of economic activities (ISIC 4.0); however, due to insufficient statistical data, weak reliability, and limited possibility to draw conclusions from sectors like " Activities of households as employers; undifferentiated goods- and services-producing activities of households for own

use" and " Activities of extraterritorial organizations and bodies", calculations were performed based on a total of 19 sectors, including "Other service activities."

The GDP sector structure is delineated and presented in the table below. Until 2035, the mining and quarry sector is projected to be the primary determinant of Mongolia's GDP. It is anticipated that the mining and quarrying sector's share will rise to 32.68% by 2030 before declining to 29.41%. Meanwhile, the Manufacturing sector is expected to see a steady increase, climbing by approximately 10 percentage points from 7.97% to 17.71%. Conversely, other sectors are predicted to remain relatively stable, with the Agriculture sector's share decreasing by 39.4% from 14.59% to 8.84%. Nevertheless, the real GDP of all sectors is anticipated to continue growing.

Table 15: Industrial composition of GDP, in percent

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	14.59%	13.06%	9.57%	8.84%
2	Mining and quarrying	25.79%	30.82%	32.68%	29.41%
3	Manufacturing	7.97%	10.28%	14.15%	17.71%
4	Electricity, gas, steam, air conditioning supply	1.58%	1.44%	1.58%	2.31%
5	Water supply; sewerage, waste management and remediation activities	0.49%	0.57%	0.68%	1.13%
6	Construction	3.71%	3.42%	3.47%	2.83%
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	11.80%	10.93%	10.87%	10.42%
8	Transportation and storage	5.22%	5.28%	5.00%	5.41%
9	Accomodation and food service activities	1.11%	0.98%	0.96%	0.62%
10	Information and communication	2.21%	1.54%	1.40%	2.09%
11	Financial and insurance activities	5.32%	4.33%	3.78%	3.39%
12	Real estate activities	5.10%	4.59%	3.48%	3.14%
13	Professional, scientific and technical activities	1.54%	1.65%	1.77%	1.87%
14	Administrative and support service activities	0.69%	0.76%	0.64%	0.55%
15	Public administration and defence; compulsory social insurancy	4.90%	3.39%	2.93%	2.77%
16	Education services	4.54%	4.05%	4.08%	4.41%
17	Human health and social work activities	2.56%	2.08%	2.20%	2.43%
18	Arts, entertainment and recreation	0.43%	0.39%	0.36%	0.34%
19	Other service activities	0.45%	0.43%	0.41%	0.32%

Table 16: GDP of Mongolia, by divisions, at 2015 constant prices, in billion MNT

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	4,252	4,940	5,129	6,845
2	Mining and quarrying	3,133	4,569	8,144	11,922
3	Manufacturing	2,343	3,444	5,994	10,189
4	Electricity, gas, steam, air conditioning supply	641	862	1,545	3,615
5	Water supply; sewerage, waste management and remediation activities	119	195	363	934
6	Construction	893	946	1,422	1,519
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	3,256	3,979	5,013	6,764

8	Transportation and storage	1,280	1,418	1,961	3,123
9	Accommodation and food service activities	349	445	691	692
10	Information and communication	783	776	960	1,885
11	Financial and insurance activities	1,457	1,578	1,960	2,547
12	Real estate activities	1,803	2,339	2,126	2,024
13	Professional, scientific and technical activities	486	761	1,285	1,948
14	Administrative and support service activities	234	385	523	602
15	Public administration and defence; compulsory social insurance	1,692	1,606	2,087	2,553
16	Education services	1,218	1,513	2,324	2,894
17	Human health and social work activities	662	744	1,195	1,642
18	Arts, entertainment and recreation	138	180	254	307
19	Other service activities	143	192	286	290
20	Taxes less subsidies on products	3,571	4,154	6,361	8,183
GDP (purchaser's prices)		**28,455**	**35,026**	**49,624**	**70,478**

In addition to presenting GDP in MNT, it is essential to convert it into USD for international comparisons. To achieve this conversion, the forward calculation of the USD exchange rate against MNT was performed and then applied to the sectors. The results are displayed in the table below. Mongolia's GDP in USD is projected to increase by 3.22 times, from 17,124 million USD in 2022 to 55,224 million USD in 2035. Given that the USD exchange rate also fluctuates, it is necessary to express GDP in both nominal and real terms. The GDP figures at 2015 comparable prices are presented in 2015 USD. At the 2015 comparable price level, GDP is expected to be 14,440 million USD in 2022, rising to 35,763 million USD in 2035.

Table 17: GDP of Mongolia, by divisions, at current prices, in million MNT

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	2,231	2,776	3,184	4,394
2	Mining and quarrying	3,944	6,550	10,869	14,625
3	Manufacturing	1,219	2,185	4,708	8,809
4	Electricity, gas, steam, air conditioning supply	242	306	524	1,150
5	Water supply; sewerage, waste management and remediation activities	75	121	225	562
6	Construction	567	727	1,154	1,407
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	1,805	2,322	3,617	5,184
8	Transportation and storage	798	1,121	1,664	2,693
9	Accommodation and food service activities	170	208	321	310
10	Information and communication	339	328	467	1,041
11	Financial and insurance activities	813	919	1,257	1,687
12	Real estate activities	780	976	1,156	1,561
13	Professional, scientific and technical activities	235	350	587	932
14	Administrative and support service activities	106	162	212	274
15	Public administration and defence; compulsory social insurance	749	721	976	1,380

16	Education services	694	861	1,357	2,194
17	Human health and social work activities	392	442	731	1,207
18	Arts, entertainment and recreation	66	84	118	167
19	Other service activities	69	91	135	159
20	Taxes less subsidies on products	1,829	2,300	3,595	5,489
GDP		**17,124**	**23,551**	**36,856**	**55,224**

3.4 Analysis of input-output table

One major use of input-output table data is to estimate the effect of changes in exogenous factors on the economy. It assesses the impact of final demand on total production forecasted through elements of the Leontief inverse matrix. At this point, multiplying the Leontief inverse matrix by the final demand vector yields the total production vector, so it is called input-output multiplier analysis.

There are three main types of multipliers:

a. Output multipliers
b. Income multipliers
c. Employment multipliers

The multiplier effect is determined by the disparity between the initial impact and the total outcome of the exogenous (final demand) change. There are two methods to calculate the total outcome. The first method distinguishes between direct and indirect outcomes, while the second method also considers induced outcomes. Multipliers derived from the first method are termed simple, whereas those from the second method are known as total multipliers.

When the final demand for a particular product rises, producers will aim to satisfy at least that level of demand, termed the first outcome. A portion of the total output change resulting from this demand increase is provided by the producer itself, known as the direct outcome. As producers expand their production, their demand for intermediate goods also increases, prompting suppliers to ramp up their supply, referred to as the indirect effect. Consequently, household incomes in the economy rise. With increased income, there is a corresponding rise in the demand for final products and services, termed the induced outcome. Since our estimates do not incorporate household income data, the analysis was confined to direct and indirect outcomes, or simple multipliers.

Output multipliers

The output multiplier is determined by the production costs of all economic industries necessary to fulfill 1 MNT of final demand for the products of that industry. Simply put, a low output multiplier suggests minimal involvement of other industries in the production process, whereas a high value indicates extensive use of products from other industries as raw materials. An increase in the production multiplier for economic industries signifies technological advancements within the sector.

As of 2019, the industry with the highest output multiplier is the electricity and heat sector (1.9475). This implies that to generate 1 MNT of added value in this industry, a total production worth 1.9475 MNT occurs across the entire economy. Conversely, for the public administration

and defense industry, which boasts the lowest output multiplier (1.1834), an additional cost of 1 MNT leads to a total production of 1.1834 MNT in the economy.

As indicated in the table, meeting a final demand of 1 MNT in the mining and quarrying industry required a total production of 1.3951 MNT in 2019, expected to rise to 1.6131 MNT in 2025, 1.7676 MNT in 2030, and 1.9110 MNT in 2035. This demonstrates the growing involvement of other industries in supporting the production processes of the mining and quarrying sector, thereby aiding in the overall economic recovery. Industries with the highest output multiplier will stimulate the production of other sectors to the greatest extent. By 2035, the electricity and heat industry is projected to have the most significant positive impact on the economy, with a multiplier of 2.2172, followed by housing and catering at 2.2049, and manufacturing at 2.0905.

Overall, the output multiplier for our country stood at 1.4530 in 2019 and is expected to steadily increase to 1.5362 in 2025, 1.6463 in 2030, and 1.7683 in 2035. This indicates an overall improvement in the technological level of the economy.

Table 18: The output multiplier, 2025, 2030, 2035 years

Division	2019	2025	2030	2035
Agriculture, forestry, fishing and hunting	1.3200	1.3267	1.2779	1.1693
Mining and quarrying	1.3951	1.6131	1.7676	1.9110
Manufacturing	1.7847	1.8535	1.9974	**2.0905**
Electricity, gas, steam, air conditioning supply	1.9475	1.7717	1.7134	**2.2172**
Water supply; sewerage, waste management and remediation activities	1.5896	1.1220	1.0070	1.0837
Construction	1.6417	1.3900	1.3827	1.3570
Wholesale and retail trade; repair of motor vehicles and motorcycles	1.3403	1.3648	1.3079	1.1754
Transportation and storage	1.3145	1.4287	1.4129	1.5460
Accomodation and food service activities	1.7176	1.8826	2.0991	**2.2049**
Information and communication	1.4683	1.2046	1.1637	1.5415
Financial and insurance activities	1.3445	1.2895	1.1771	1.0464
Real estate activities	1.3106	1.3179	1.3331	1.3668
Professional, scientific and technical activities	1.4341	1.4493	1.4181	1.4011
Administrative and support service activities	1.7005	1.6256	1.4347	1.2370
Public administration and defence; compulsory social insurancy	1.1834	1.0385	1.0531	1.0617
Education services	1.3140	1.2709	1.2219	1.2106
Human health and social work activities	1.3088	1.2425	1.1387	1.1039
Arts, entertainment and recreation	1.3865	1.3229	1.1834	1.2109
Other service activities	1.6613	1.6332	1.5944	1.4842
TOTAL	**1.4530**	**1.5362**	**1.6463**	**1.7683**

Employment multiplier

In practice, two forms of employment multipliers are calculated and utilized in research. The first assesses how changes in final demand costs impact labor supply and is termed the employment multiplier. Similar to the output multiplier, there are three types: simple, total, and cutdown, depending on whether the model is open or closed. The second evaluates how changes in total

production costs influence labor supply. Similarly, there are types I and II, and cut type II, depending on the model being utilized. Since household income cannot be directly calculated, we derived employment multipliers and type I employment multipliers from the open model of the interdisciplinary balance.

The table below presents the employment multipliers for 2019 (actual performance), 2025, 2030, and 2035 (revised) at current year prices. **The economic interpretation of the employment multiplier is the number of workers required to produce 1 MNT in the industry.** Given that our interdisciplinary balance is expressed in million MNT, in this context, it represents the number of workers needed for a total production of 1 million MNT. To clarify, we can say that it indicates the number of workers required for a total production of 1 billion MNT when the amount of money is changed.

According to the table, the mining and quarry industry exhibits one of the lowest employment multipliers (excluding the real estate industry). Specifically, the total production of the mining and quarry industry amounting to 1 billion MNT, calculated at 2015 comparable prices, necessitates 13.6 workers in 2019, 15.6 workers in 2025, 11.4 workers in 2030, and 8.7 workers in 2035.

Table 19: The employment multiplier, at 2025, 2030, 2035 year, and 2015 constant prices

Division	2019	2025	2030	2035
Agriculture, forestry, fishing and hunting	59.3	48.6	40.9	27.6
Mining and quarrying	13.6	15.6	11.4	8.7
Manufacturing	37.6	30.4	21.8	14.6
Electricity, gas, steam, air conditioning supply	20	10.7	6	4.4
Water supply; sewerage, waste management and remediation activities	51.6	27.3	16.7	8
Construction	23.5	27.2	21.9	23
Wholesale and retail trade; repair of motor vehicles and motorcycles	35.6	30.9	23.7	15.9
Transportation and storage	20.4	24.5	16.5	10.9
Accomodation and food service activities	53.9	43.3	30.5	25.3
Information and communication	17.2	12.8	9.4	7.4
Financial and insurance activities	18.7	19.8	18.4	17
Real estate activities	4.9	7.0	6.9	8.9
Professional, scientific and technical activities	25.2	15.8	10.9	7.8
Administrative and support service activities	42.5	26.9	20.9	18.8
Public administration and defence; compulsory social insurancy	36.6	42.4	39.9	39.2
Education services	69	67.4	51.4	47.6
Human health and social work activities	50.1	46.3	31.5	25
Arts, entertainment and recreation	105.6	64.5	61.1	68.1
Other service activities	90.9	87.2	59.9	57.1
TOTAL	**44.9**	**39.4**	**30.5**	**24.6**

A decrease in the employment multiplier, or the number of required workers, indicates a reduction in the reliance on physical labor within the industry, the establishment of technological progress, and an increase in labor productivity.

In Mongolia, 44.9 workers were needed in 2019, 39.4 workers in 2025, 30.5 workers in 2030, and 24.6 workers in 2035 for the total production of 1 billion MNT at 2015 comparative prices. Put differently, by 2035, compared to 2019, the number of workers required for the total production of 1 MNT will decrease by 1.83 times.

This decrease varies across economic sectors. The number of workers required for the total production of 1 billion MNT in the agricultural industry will decrease by 2.15 times, in the mining and quarry industry by 1.57 times, in the manufacturing industry by 2.57 times, and in the electricity and heat industry by 4.53 times. The relatively lesser decline in the mining industry compared to agriculture can be attributed to its current reliance on relatively technology-intensive methods. However, there is ample opportunity to introduce new technologies in the agricultural industry of our country.

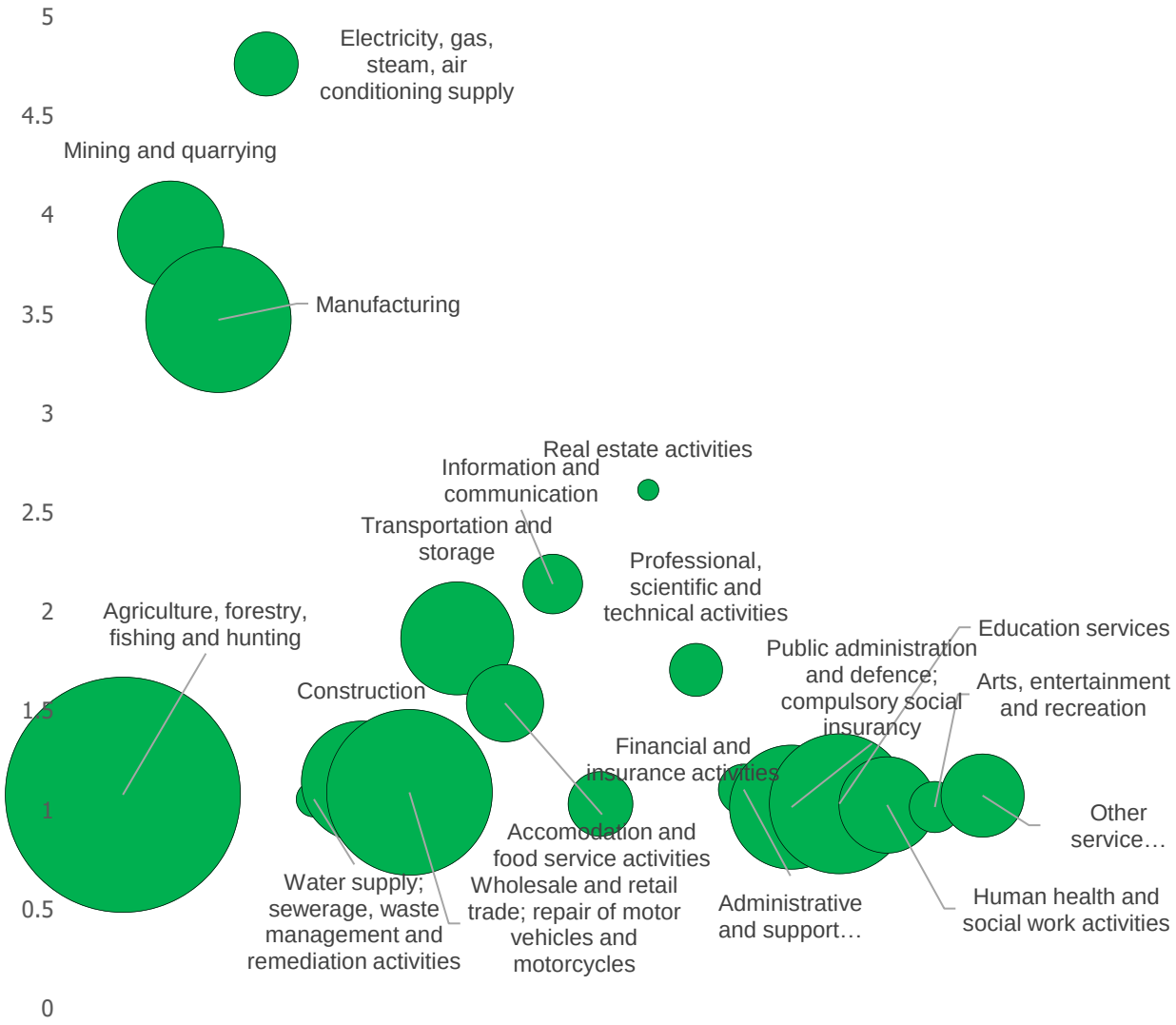
The other type of employment multiplier is the Type I employment multiplier. **This multiplier indicates how many jobs are created in the economy by 1 worker in the industry.** Type I employment multiplier is calculated from the results of total production converted to 2015 comparative prices. The results are shown in the table below. For example, for every 1 worker in the mining and quarry industry, 0.8762 (1.8762-1=0.8762) jobs were created in other industries in 2019, 1.3422 (2.3422-1=1.3422) jobs in 2025, 2.1482 jobs in 2030, and 2.9044 jobs in 3035. The industry where 1 worker creates the most jobs in other industries is the Electricity and Heating industry, with a multiplier of 3.7623.

Table 20: Type I employment multiplier, at 2025, 2030, 2035 year, and 2015 constant prices

Division	2019	2025	2030	2035
Agriculture, forestry, fishing and hunting	1.1682	1.1777	1.1241	1.0771
Mining and quarrying	1.8762	2.3422	3.1482	**3.9044**
Manufacturing	3.1861	3.1495	3.4246	**3.4724**
Electricity, gas, steam, air conditioning supply	2.2752	2.3946	2.4517	**4.7623**
Water supply; sewerage, waste management and remediation activities	1.2816	1.0657	1.0038	1.0545
Construction	1.9784	1.3097	1.2589	1.1448
Wholesale and retail trade; repair of motor vehicles and motorcycles	1.1880	1.2234	1.1682	1.0892
Transportation and storage	1.4551	1.4735	1.5236	1.8658
Accomodation and food service activities	1.4073	1.5326	1.6967	1.5386
Information and communication	1.9390	1.3296	1.2422	2.1400
Financial and insurance activities	1.4746	1.3618	1.1541	1.0306
Real estate activities	9.9483	6.8599	3.6222	2.6143
Professional, scientific and technical activities	1.4000	1.7530	1.7751	1.7068
Administrative and support service activities	1.4492	1.5468	1.2990	1.1035
Public administration and defence; compulsory social insurancy	1.1067	1.0155	1.0168	1.0146
Education services	1.0831	1.0631	1.0468	1.0316
Human health and social work activities	1.1194	1.0803	1.0448	1.0257
Arts, entertainment and recreation	1.0575	1.0616	1.0239	1.0152
Other service activities	1.1522	1.1332	1.1283	1.0731
TOTAL	**2.0899**	**2.1268**	**2.4114**	**2.9300**

The figure below compares the employment multiplier in 2035 (vertical axis) with the number of workers in 2022 (circle size). Interestingly, despite not having a large number of total workers, the electricity and heat industry exhibits a high employment multiplier. On the other hand, the agricultural industry, while employing a relatively high number of workers compared to other sectors, demonstrates a low employment multiplier.

Figure 26: Type I emplyment multiplier and number of workers in 2035



3.5 GDP forecasting of regions

When forecasting the GDP of Mongolia's provinces, regions, and Ulaanbaatar city until 2035, nominal GDP data from 2000 to 2022 was utilized, applying the deflator at 2015 comparable prices. Utilizing this data, future GDP projections were derived for these regions by employing Hodrick-Prescott analysis to remove cyclical effects and extract trends. The values projected from this trend were estimated using linear, quadratic, and exponential functions.

Average growth rates were computed for provinces and the capital city across three versions for the period 2023-2035. Among these versions, Bulgan province consistently exhibits the slowest

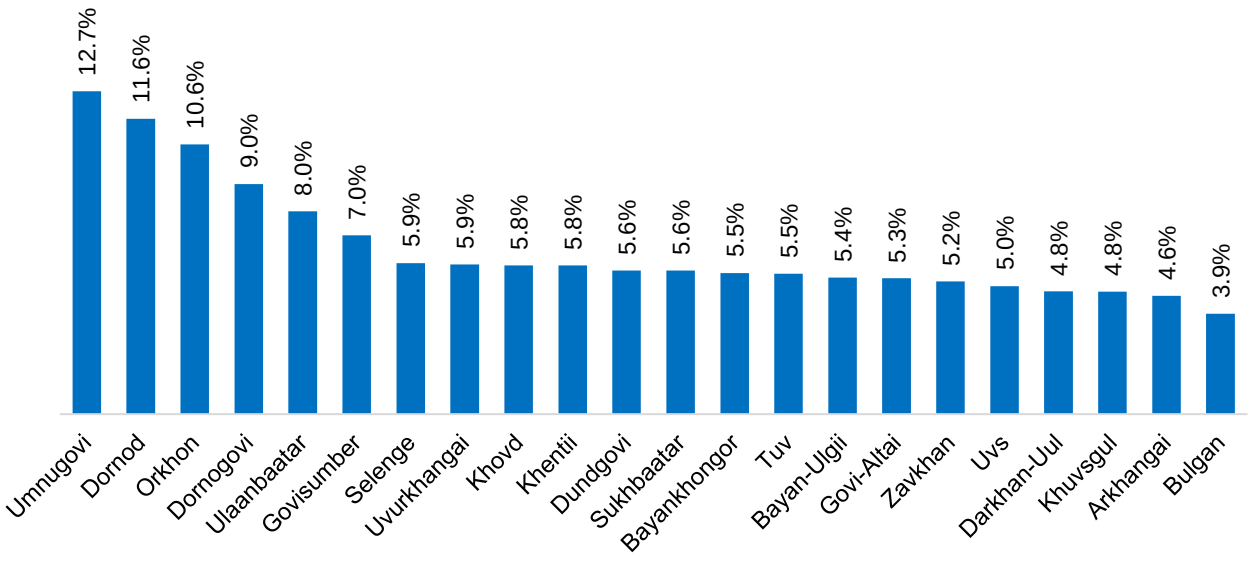
growth. Conversely, according to calculations from all three versions, Umnugobi province demonstrates the fastest growth rate.

Table 21: Average growth rate of provinces and capital

№	Provinces	Average rate of slow growth	Average potential growth rate	Average rate of rapid growth
1	Arkhangai	2.5%	4.2%	4.6%
2	Bayan-Ulgii	2.8%	4.5%	5.4%
3	Bayankhongor	2.0%	2.7%	5.5%
4	Bulgan	1.8%	2.3%	3.9%
5	Govi-Altai	2.8%	4.5%	5.3%
6	Govisumber	**3.1%**	4.0%	**7.0%**
7	Darkhan-Uul	2.6%	3.8%	4.8%
8	Dornogovi	**3.4%**	4.4%	**9.0%**
9	Dornod	**3.6%**	4.0%	**11.6%**
10	Dundgovi	2.8%	3.8%	5.6%
11	Zavkhan	2.7%	3.7%	5.2%
12	Orkhon	2.0%	3.6%	**10.6%**
13	Uvurkhangai	2.9%	4.1%	5.9%
14	Umnugovi	**3.8%**	**6.9%**	**12.7%**
15	Selenge	2.5%	2.8%	5.9%
16	Sukhbaatar	2.2%	2.7%	5.6%
17	Tuv	2.8%	3.9%	5.5%
18	Uvs	2.7%	4.5%	5.0%
19	Khuvsgul	2.6%	3.3%	4.8%
20	Khovd	2.9%	**5.7%**	5.8%
21	Khentii	2.9%	4.4%	5.8%
22	Ulaanbaatar	**3.2%**	3.5%	**8.0%**

The provinces and Ulaanbaatar city that are expected to experience the fastest growth rates include Gobisumber, Dornogobi, Dornod, Orkhon, and Ulaanbaatar. Conversely, Arkhangai, Bayan-Ulgii, Bayankhongor, Bulgan, Darkhan-Uul, Dundgobi, Zavkhan, Uvurkhangai, Selenge, Uvs, Tuv, Khuvsgul, and Gobi-Altai provinces are anticipated to have slower growth rates, with their highest average annual growth rate projected to be less than 6%. Migration statistics indicate a trend of more migration from provinces with slower growth rates, while provinces experiencing higher growth rates tend to attract more migrants.

Figure 27: Percentage of potential growth of provinces



Regions such as Ulaanbaatar and the central and eastern regions exhibit higher growth potential compared to the western and Khangai regions.

Table 22: Percentage of potential growth of regions

д.д	Regions	Average rate of slow growth	Average potential growth rate	Average rate of rapid growth
1	Western region	2.8%	4.7%	5.3%
2	Khangai region	2.3%	4.2%	5.3%
3	Central region	3.1%	4.7%	7.1%
4	Eastern region	3.2%	3.6%	7.8%
5	Ulaanbaatar	3.2%	3.5%	8.0%

GDP forecasting of Ulaanbaatar city

The table below presents the data of econometric models for the real GDP of Ulaanbaatar city region, obtained by separating the data using the Hodrick-Prescott filter.

Table 23: Econometric models of real GDP trend of Ulaanbaatar city

Type of econometric model	Linear Regression Model	Quadratic model	Exponential model
Dependent variable	$ubsgdp_t$	$ubsgdp_t$	$\log(ubsgdp_t)$
Constant term (intercept)	2796729.00^{***}	3012576.0^{***}	15.25^{***}
t	743834.1^{***}	682163.5^{***}	0.077^{***}
t^2		2803.21	
R^2	0.993	0.994	0.970
AR^2	0.992	0.993	0.968
Standard deviation of residuals	426757.0	421083.3	0.09
Akaike's Information	28.85	28.86	-1.79

Criterion (AIC)			
Schwarz criterion / Bayesian Information Criterion (BIC)	28.95	29.00	−1.70

The table below displays the forecast of the real GDP of Ulaanbaatar for the period 2023-2025 using three different models.

Table 24: Real GDP forecast of the Ulaanbaatar city until 2035, in billion MNT

Year	Actual value	Exponential model	Linear Regression Model	Quadratic model
2022	17,726	22,603	19,161	19,377
2023	-	24,404	19,905	20,185
2024	-	26,349	20,649	20,999
2025	-	28,448	21,393	21,819
2026	-	30,714	22,136	22,644
2027	-	33,161	22,880	23,475
2028	-	35,803	23,624	24,311
2029	-	38,656	24,368	25,153
2030	-	41,735	25,112	26,000
2031	-	45,061	25,856	26,854
2032	-	48,651	26,599	27,712
2033	-	52,527	27,343	28,577
2034	-	56,711	28,087	29,447
2035	-	61,230	28,831	30,322

GDP forecasting of western region

The real GDP of the western region (Bayan-Ulgii, Gobi-Altai, Zavkhan, Uvs, and Hovd provinces) is separated by the Hodrick-Prescott filter, and the data of the econometric models is shown in the table below.

Table 25: Econometric models of real GDP trend of the Western region

Type of econometric model	Linear Regression Model	Quadratic model	Exponential model
Dependent variable	$wrgdp_t$	$wrgdp_t$	$\log(wrgdp_t)$
Constant term (intercept)	478489.2^{***}	612259.0^{***}	13.28^{***}
t	56736.70^{***}	18516.75^{***}	0.052^{***}
t^2		1737.27^{***}	
R^2	0.964	0.996	0.990
AR^2	0.962	0.995	0.989
Standard deviation of residuals	75791.41	26200.85	0.04
Akaike's	25.39	23.3	−3.69

Information Criterion (AIC)			
Schwarz criterion / Bayesian Information Criterion (BIC)	25.49	23.5	−3.59

The table below displays the forecast of the real GDP of Ulaanbaatar for the period 2023-2025 using three different models.

Table 26: Real GDP forecast of the Western region until 2035, in billion MNT

Year	Actual value	Exponential model	Linear Regression Model	Quadratic model
2022	1,805	1,841	1,727	1,860
2023	-	1,940	1,783	1,957
2024	-	2,044	1,840	2,057
2025	-	2,153	1,897	2,161
2026	-	2,268	1,954	2,268
2027	-	2,389	2,010	2,379
2028	-	2,517	2,067	2,493
2029	-	2,652	2,124	2,610
2030	-	2,794	2,181	2,731
2031	-	2,943	2,237	2,856
2032	-	3,101	2,294	2,984
2033	-	3,266	2,351	3,115
2034	-	3,441	2,408	3,250
2035	-	3,625	2,464	3,389

GDP forecasting of Khangai region

The table below presents the data of econometric models and the real GDP of the Khangai region (comprising Arkhangai, Bayankhongor, Bulgan, Uvurkhangai, Khuvsgul, and Orkhon provinces) separated by the Hodrick-Prescott filter.

Table 27: Econometric models of real GDP trend of the Khangai region

Type of econometric model	Linear Regression Model	Quadratic model	Exponential model
Dependent variable	$mrgdp_t$	$mrgdp_t$	$\log(mrgdp_t)$
Constant term (intercept)	1569390.3^{***}	1411073.3^{***}	14.32^{***}
t	101827.5^{***}	147060.9^{***}	0.041^{***}
t^2		-2056.06^{**}	
R^2	0.976	0.99	0.916
AR^2	0.975	0.98	0.912
Standard deviation of residuals	110810.1	73526.35	0.08
Akaike's	26.15	25.37	−1.98

Information Criterion (AIC)			
Schwarz criterion / Bayesian Information Criterion (BIC)	27.25	25.52	−1.88

The table below illustrates the forecast of the real GDP of the Khangai region for the period 2023-2025 using three different models.

Table 28: Real GDP forecast of the Khangai region until 2035, in billion MNT

Year	Actual value	Exponential model	Linear Regression Model	Quadratic model
2022	3,725	4,072	3,810	3,783
2023	-	4,243	3,911	3,927
2024	-	4,421	4,013	4,089
2025	-	4,607	4,115	4,268
2026	-	4,800	4,217	4,467
2027	-	5,002	4,319	4,688
2028	-	5,212	4,421	4,931
2029	-	5,431	4,522	5,200
2030	-	5,659	4,624	5,495
2031	-	5,896	4,726	5,819
2032	-	6,143	4,828	6,172
2033	-	6,401	4,930	6,557
2034	-	6,670	5,032	6,976
2035	-	6,950	5,133	7,430

GDP forecasting of Central region

The table below displays the data of econometric models and the real GDP of the Central region, comprising Dornogobi, Dundgobi, Umnugobi, Selenge, Tuv, Darkhan-Uul, and Gobisumber provinces, separated by the Hodrick-Prescott filter.

Table 29: Econometric models of real GDP trend of the Central region

Type of econometric model	Linear Regression Model	Quadratic model	Exponential model
Dependent variable	$crgdp_t$	$crgdp_t$	$\log(crgdp_t)$
Constant term (intercept)	551865.7^{***}	753128.5^{***}	13.60^{***}
t	122088.6^{***}	64584.92^{***}	0.069^{***}
t^2		2613.80^{***}	
R^2	0.984	0.999	0.995
AR^2	0.983	0.999	0.994
Standard deviation of residuals	109207.9	20573.41	0.034
Akaike's	26.12	22.82	−3.84

Information Criterion (AIC)			
Schwarz criterion / Bayesian Information Criterion (BIC)	26.22	22.97	−3.74

The table below illustrates the forecast of the real GDP of the Central region from 2023 to 2025, as projected by three different models.

Table 30: Real GDP forecast of the Central region until 2035, in billion MNT

Year	Actual value	Exponential model	Linear Regression Model	Quadratic model
2022	3,853	3,654	3,238	3,439
2023	-	3,915	3,360	3,621
2024	-	4,194	3,482	3,809
2025	-	4,492	3,604	4,001
2026	-	4,812	3,726	4,199
2027	-	5,155	3,848	4,402
2028	-	5,522	3,970	4,611
2029	-	5,916	4,092	4,824
2030	-	6,337	4,215	5,043
2031	-	6,788	4,337	5,267
2032	-	7,272	4,459	5,496
2033	-	7,790	4,581	5,731
2034	-	8,344	4,703	5,971
2035	-	8,939	4,825	6,216

GDP forecasting of the Eastern region

The table below presents the real GDP of the Eastern region, comprising Dornod, Sukhbaatar, and Khentii provinces, as separated by the Hodrick-Prescott filter and the data of econometric models.

Table 31: Econometric models of real GDP trend of the Eastern region

Type of econometric model	Linear Regression Model	Quadratic model	Exponential model
Dependent variable	$srgdp_t$	$srgdp_t$	$\log(srgdp_t)$
Constant term (intercept)	226745.0^{***}	252541.3^{***}	12.73^{***}
t	57752.01^{***}	50381.63^{***}	0.075^{***}
t^2		335.02	
R^2	0.987	0.988	0.975
AR^2	0.986	0.987	0.974
Standard deviation of residuals	45447.85	44384.81	0.083
Akaike's Information	24.37	24.36	−2.05

Criterion (AIC)			
Schwarz criterion / Bayesian Information Criterion (BIC)	24.47	24.50	−1.95

The figure below illustrates the forecast of the real GDP of the Eastern region for the period 2023-2025 using the three econometric models.

Table 32: Real GDP forecast of the Eastern region until 2035, in billion MNT

Year	Actual value	Exponential model	Linear Regression Model	Quadratic model
2022	1,347	1,746	1,497	1,523
2023	-	1,882	1,555	1,589
2024	-	2,028	1,613	1,655
2025	-	2,185	1,671	1,721
2026	-	2,355	1,728	1,789
2027	-	2,537	1,786	1,857
2028	-	2,734	1,844	1,926
2029	-	2,947	1,902	1,995
2030	-	3,175	1,959	2,066
2031	-	3,422	2,017	2,136
2032	-	3,687	2,075	2,208
2033	-	3,973	2,133	2,280
2034	-	4,282	2,190	2,353
2035	-	4,614	2,248	2,426

The GDP distribution by provinces and regions for 2025, 2030, and 2035 was projected both at annual prices and 2015 comparable prices. In 2025, Gobisumber province is forecasted to have the lowest real GDP at 100 billion MNT, while Orkhon province is expected to have the highest real GDP at 1,885 billion MNT. On average, the real GDP of the provinces is anticipated to surpass 500 billion MNT in 2025, 800 billion MNT in 2030, and 1.1 trillion MNT in 2035.

Table 33: GDP of regions and provinces, at 2015 constant prices, in billion MNT, mixed trend model

Country, region, province	2025	2030	2035
Country	35,026	49,624	70,478
Western region	2,016	2,779	3,784
Bayan-Ulgii	401	551	753
Govi-Altai	302	414	566
Zavkhan	401	547	742
Uvs	385	521	702
Khovd	528	746	1,021
Khangai region	4,099	5,205	6,555
Arkhangai	483	629	814
Bayankhongor	333	391	446

Bulgan	303	360	421
Orkhon	1,885	2,379	2,988
Uvurkhangai	503	654	831
Khuvsgul	591	792	1,055
Central region	4,207	6,538	10,386
Govisumber	100	129	162
Darkhan-Uul	492	659	878
Dornogovi	425	559	714
Dundgovi	275	351	439
Umnugovi	1,449	2,786	5,332
Selenge	845	1,194	1,677
Tuv	621	860	1,184
Eastern region	1,676	2,250	2,980
Dornod	725	920	1,129
Sukhbaatar	507	706	979
Khentii	443	624	873
Ulaanbaatar	23,028	32,852	46,771

In the absence of sufficient statistics, the GDP of provinces and regions was classified into 9 industries, aligning with the common practice in our country's statistical methodology. This classification involved transferring the results of all economic activities (19 industries) to these 9 industries. The process involved mapping the industry classification (ISIC) to the provincial and regional industry classification. The added value of the 9 provinces and regions for the years 2025, 2030, and 2035 was then calculated using both current prices and 2015 constant prices, and the results were compiled into a matrix.

CHAPTER 4

MID-TERM FORECASTING OF POPULATION AND LABOR FORCE

4. MID-TERM FORECASTING OF POPULATION AND LABOR FORCE

4.1 Projection of Mongolia's population growth

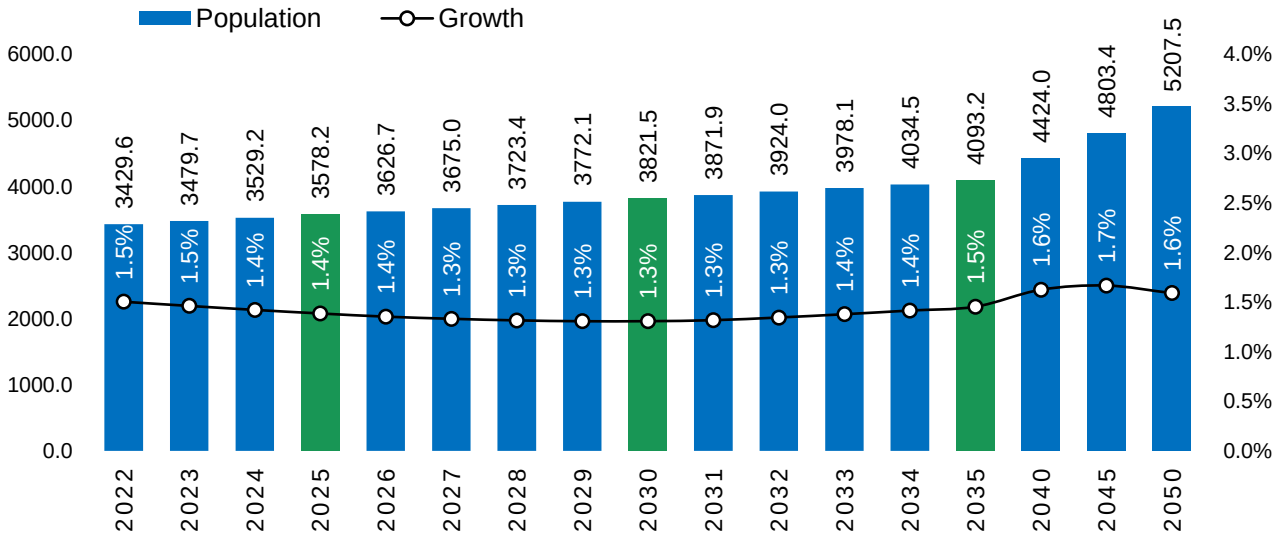
In the population projection, the base population was determined as the annual average population as of July 1 of the current year, derived from the findings of the 2020 Population and Housing Census. Fertility rate assumptions were based on both total fertility rate and age-group-specific fertility rate, with an expectation of maintaining the birth rate observed over the past 10-20 years.

For mortality rate forecasts, the trends of the past 30 years were considered, assuming an increase in life expectancy. Migration estimates were derived using the United Nations Far East Asia model to gauge the probability of migration within age groups. Foreign migration levels observed in 2010 and 2020 were maintained for the subsequent 10-15 years.

Calculations were executed using the MORTPACK program, providing results categorized by one age group, five age groups, and gender. From these calculations, the numbers of young population (aged 0-14), working-age population (15-59 for females, 15-65 for males), and elderly population (65+) required for demographic load were determined. The 2020 data stems from the Population and Housing Census, while projections for other years are outcomes of projection calculations.

According to these projections, Mongolia's population is expected to reach 4.093 million by 2035. This reflects a 23% increase compared to 2020, with an average annual net growth rate of 1.4%. Compared to 2022, this represents a projected increase of 19% (663 thousand individuals).

Figure 28: Population growth in Mongolia, thousand people, up to 2035



In order to align the projection of population growth with future employment and economic conditions, it has been computed at the provincial level using 5 age intervals. These figures were aggregated and computed at the regional and national levels, and the average annual growth over 5 years was determined as follows.

Table 34: Population of Mongolia, by region, provinces, 2020-2035

Location	Population				Average annual growth rate		
	2020	2025	2030	2035	2020-2025	2025-2030	2030-2035
Total	3’225’152	3’578’166	3’822’867	4’093’501	2.10	1.33	1.38
Western region	407’704	446’898	474’131	506’012	1.85	1.19	1.31
Bayan-Ulgii	104’880	115’269	123’732	133’153	1.91	1.43	1.48
Govi-Altai	57’911	62’736	65’457	68’812	1.61	0.85	1.00
Zavkhan	72’769	78’908	82’829	87’569	1.63	0.97	1.12
Uvs	83’618	91’394	96’197	102’509	1.79	1.03	1.28
Khovd	88’526	98’591	105’916	113’969	2.18	1.44	1.48
Khangai region	600’941	648’118	676’267	711’199	1.52	0.85	1.01
Arkhangai	94’696	103’603	108’670	114’930	1.81	0.96	1.13
Bayankhongor	88’669	94’800	98’915	104’007	1.35	0.85	1.01
Bulgan	61’430	67’393	69’938	73’009	1.87	0.74	0.86
Uvurkhangai	116’261	126’387	132’594	140’211	1.68	0.96	1.12
Khuvsgul	135’188	144’283	150’556	158’303	1.31	0.85	1.01
Orkhon	104’697	111’652	115’594	120’739	1.29	0.70	0.87
Central region	509’619	546’346	572’705	602’524	1.40	0.95	1.02
Dornogovi	70’546	74’416	77’450	80’824	1.07	0.80	0.86
Dundgovi	46’986	50’533	53’045	55’918	1.47	0.98	1.06
Umnugovi	70’553	72’404	77’450	80’824	0.52	1.36	0.86
Selenge	108’062	118’170	123’881	131’042	1.80	0.95	1.13
Tuv	92’870	101’712	106’394	112’300	1.84	0.90	1.09
Darkhan-Uul	102’876	110’346	114’825	120’885	1.41	0.80	1.03
Govisumber	17’726	18’765	19’660	20’731	1.15	0.94	1.07
Eastern region	224’256	239’067	251’557	266’432	1.29	1.02	1.16
Dornod	82’746	89’114	94’269	100’341	1.49	1.13	1.26
Sukhbaatar	63’596	67’216	70’529	74’582	1.11	0.97	1.12
Khentii	77’914	82’737	86’759	91’509	1.21	0.95	1.07
Ulaanbaatar	1’482’632	1’697’737	1’848’207	2’007’334	2.75	1.71	1.67

The growth rate indicates that the population growth of Ulaanbaatar city will be the highest between 2020 and 2025, decreasing in the subsequent 5 years, yet remaining relatively high compared to other provinces. National figures reveal an average annual growth rate of 2.1% for the period 2020-2025, primarily driven by the rapid expansion of Ulaanbaatar city.

Population pyramid:

Population age projections for 2022, 2025, 2030, and 2035 are depicted below. By 2035, there will be a bulge in the working-age population, reflecting an increase in the number of individuals

within this age group. This trend arises from the period between 1993 and 2006 when the birth rate was low, averaging around 50,000 children annually. Individuals born during this period now constitute the majority of the current labor force. However, since 2007, the number of births has risen, reaching 83,000 in 2014. Consequently, individuals born after 2007 are anticipated to comprise the primary working-age cohort in 2035.

Figure 29: Population pyramid for the age and sex, 2022, 2025, 2030, 2035

Table 35: Population projection, by age group, 2020-2035

	2020	2025	2030	2035
0-4	383’660	379’145	364’509	386’745
5-9	380’969	379’880	376’458	363’098
10-14	289’405	377’971	377’912	375’586
15-19	221’294	286’410	375’832	376’892
20-24	238’222	218’123	284’083	374’458
25-29	270’835	234’767	215’821	282’745
30-34	307’408	266’953	232’174	214’522
35-39	256’021	302’640	263’640	230’405
40-44	226’272	250’613	297’930	260’839
45-49	200’429	219’680	244’909	293’231
50-54	168’539	192’192	212’281	238’835
55-59	143’219	158’466	182’520	203’931
60-64	101’288	130’691	146’407	171’208
65-69	56’827	88’039	115’709	132’208
70-74	34’526	45’368	72’929	98’426
75-79	24’670	24’094	33’666	56’673
80+	23’620	23’145	24’702	33’369
TOTAL	**3’327’204**	**3’578’178**	**3’821’482**	**4’093’171**

Working age population

According to researchers, leveraging Mongolia's demographic window presents an opportunity to bolster economic growth through enhanced labor productivity, improved living standards, and income growth. Capitalizing on this period, characterized by a sizable working-age population, calls for policy initiatives aimed at expanding the economy, elevating income levels, and fostering

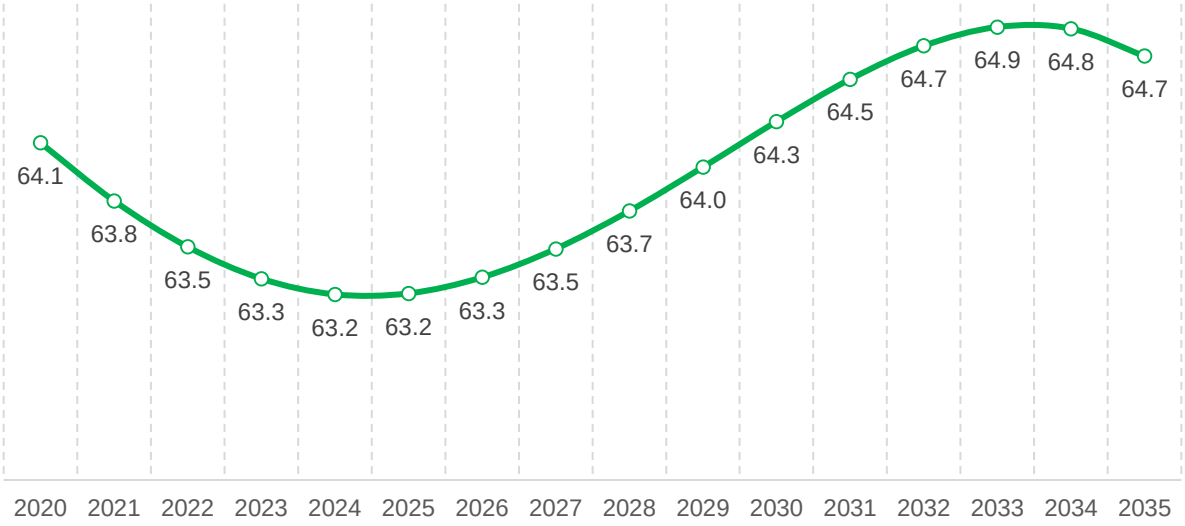
greater savings. By harnessing the projected population growth, a forecast of the labor force available for the job market has been devised.

Table 36: Working age population (Population aged 15 and above), 2020-2035

	2020	2025	2030	2035
Male	1’040’234	1’104’743	1’206’922	1’309’945
Female	1’093’293	1’155’792	1’248’675	1’337’120
Total	2’1335’27	2’260’535	2’455’597	2’647’065

According to the working-age population estimate, by 2035, the working-age population will reach 2,647.1 thousand, comprising 64.7% of the total population. This reflects a slight uptick compared to the 64.1% recorded in the 2020 Population and Housing Census results. Over the entire period, it is projected to peak at 64.9% in 2033, with this figure expected to taper off thereafter.

Figure 30: Percentage of working age population to total population, 2020-2035



Assuming no major structural changes in the economy, Mongolia's population is projected to reach 4.1 million by 2035. If the current ratio of population to the labor force remains unchanged, the working-age population and labor force in 2035 would be as follows:

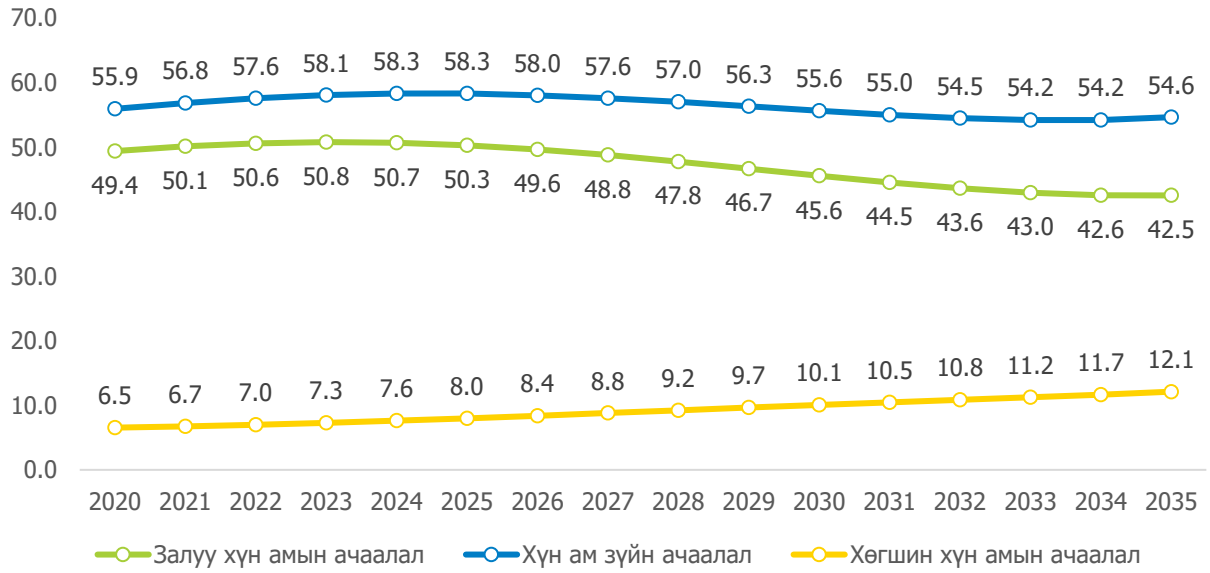
Working age population	2’552.6 thousand /researcher’s calculations/
Labor force	1’531.9 thousand

Dependency ratio forecasting

Dependency ratio is one of the key indicators of population age structure in demographic studies. This indicator is mainly used to analyze the age structure. The ratio of the population aged 0-14 and over 65 per 100 people of working age (15-64) is shown as a percentage. In addition, the ratio is shown separately for children in the 0-14 age group and for the elderly over 65 years old. This is used to explain the concept of the "Demographic Window" mentioned earlier.

According to the projections for population growth in Mongolia, the dependency ratio will decrease from 55.9% in 2020 to 54.6% in 2035, but it will increase again by 2050. The figure shows that *the ratio of the elderly population will continue to increase due to the increase in life expectancy, while the ratio of the young population will decrease due to the decrease in the birth rate.* Therefore, short- and medium-term policies need to reflect the use of this period of declining dependency ratio. For the young population, the dependency ratio will decrease by 6.9 percentage points from 49.4% in 2020 to 42.5% by 2035.

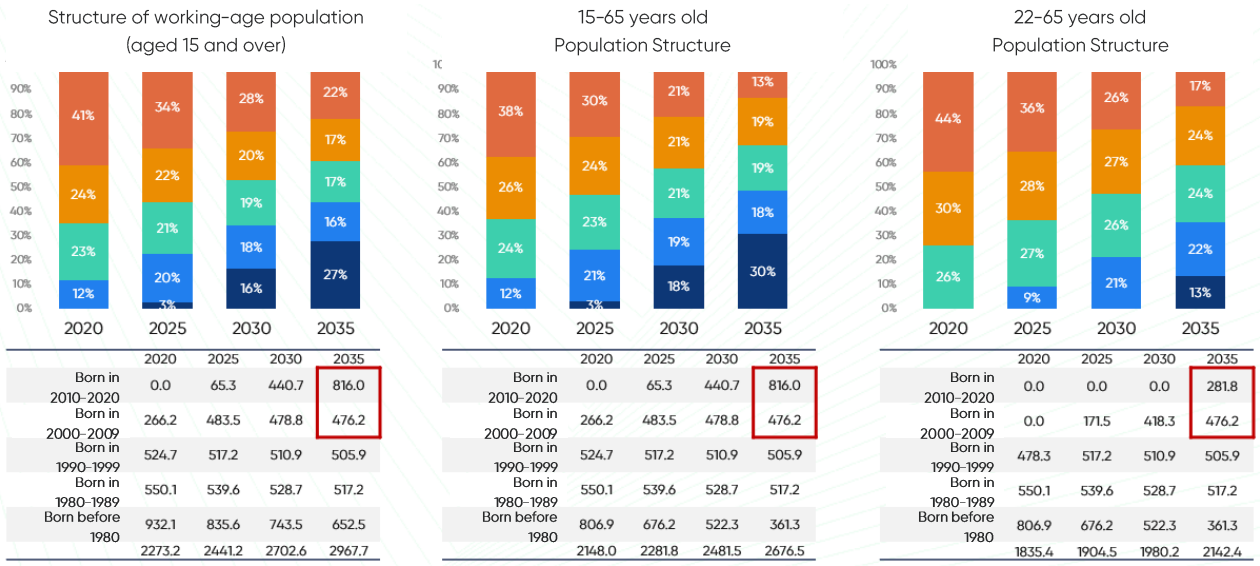
Figure 31: Total dependency ratio, in percent, 2020-2035



As for the elderly population, the dependency ratio, which was 6.5% in 2020, is projected to increase by 5.6 percentage points, reaching 12.1% in 2035. This could potentially pose challenges for the economy if pension and benefit policies are not revised.

Population age structure: Population age structure by birth year reveals intriguing findings. The analysis was conducted in three versions. By 2035, there will be 1.3 million "new millennials" or individuals born after 2000 entering the workforce. This translates to 43% of the working-age population being millennials, necessitating a significant overhaul of human resource policies within companies.

Figure 32: Population age structure, 2035



	2020	2025	2030	2035
Born in 2010-2020	0.0	65.3	440.7	816.0
Born in 2000-2009	266.2	483.5	478.8	476.2
Born in 1990-1999	524.7	517.2	510.9	505.9
Born in 1980-1989	550.1	539.6	528.7	517.2
Born before 1980	932.1	835.6	743.5	652.5
	2273.2	2441.2	2702.6	2967.7

	2020	2025	2030	2035
Born in 2010-2020	0.0	65.3	440.7	816.0
Born in 2000-2009	266.2	483.5	478.8	476.2
Born in 1990-1999	524.7	517.2	510.9	505.9
Born in 1980-1989	550.1	539.6	528.7	517.2
Born before 1980	806.9	676.2	522.3	361.3
	2148.0	2281.8	2481.5	2676.5

	2020	2025	2030	2035
Born in 2010-2020	0.0	0.0	0.0	281.8
Born in 2000-2009	0.0	171.5	418.3	476.2
Born in 1990-1999	478.3	517.2	510.9	505.9
Born in 1980-1989	550.1	539.6	528.7	517.2
Born before 1980	806.9	676.2	522.3	361.3
	1835.4	1904.5	1980.2	2142.4

Indeed, it's crucial to delve into and compare the demographics of those newly entering the working age with those exiting it.

Table 37: Working age labor force between 2020-2035

Year	16 years old population		Female (54 years old), Male (59 years old)		GAP
	Percentage of total population composition	16 years old population	Percentage of total population composition	Female (54 years old), Male (59 years old)	
2020	1.34	44’649	0.859	28’591	16’058
2025	1.70	60’984	0.904	32’355	28’629
2030	2.05	78’247	0.955	36’494	41’753
2035	1.79	73’392	0.998	40’846	32’546

The influx and outflux of individuals into and out of the working-age bracket are projected to rise from 16,058 in 2020 to 32,546 in 2035. The peak of those entering the working age will occur in 2030, reaching 2.05%.

Meanwhile, the population eligible for retirement was 9.6% in 2020 and is expected to climb by 5.1 percentage points to 14.7% by 2035. However, maintaining the retirement age at 65 for both men and women, as per the new law, will lead to a reduction in the number of retirees.

Table 38: Pension-age population 2020-2035

Он	Percentage of pensioners in total population	Total	Male aged 60 and above	Female aged 55 and above
2020	9.60	319’587	97’981	221’606
2025	11.13	398’236	122’696	275’540

2030	12.88	492’052	154’218	337’834
2035	14.66	600’403	195’484	404’919

According to the calculations, the pension-age population is projected to increase by 1.8 times by 2035 compared to 2020, reaching 405,000.

4.2 Migration forecasting

Foreign migration of the labor force of Mongolia

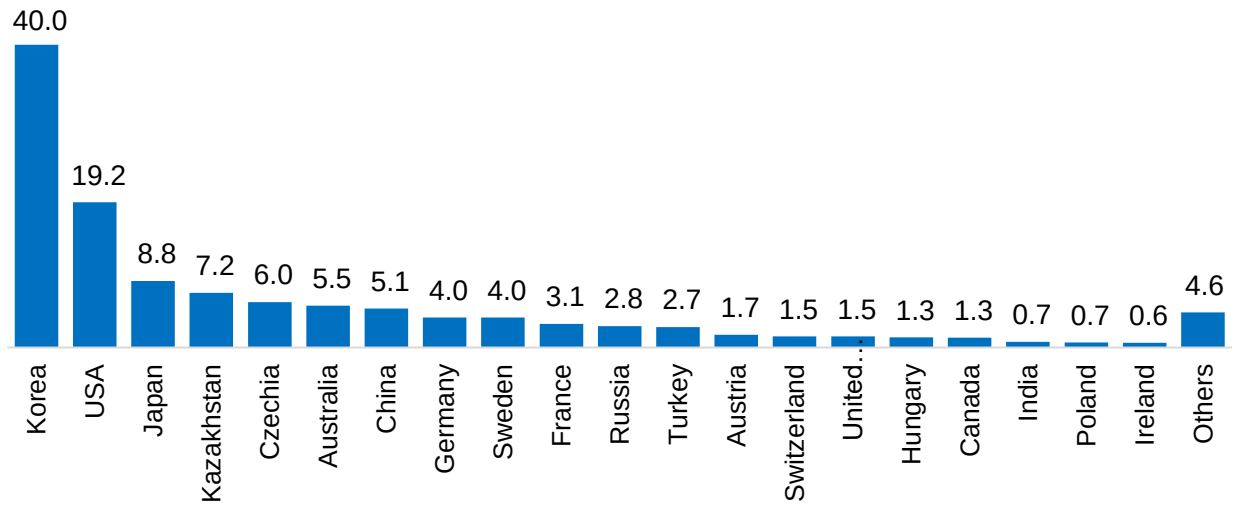
Conditions: Citizens migrating from Mongolia have a negative impact on the labor market. Information on this issue has been compiled from multiple sources, including the Administrative Register (Border Port Register), Administrative Registers of State Institutions responsible for Foreign Relations, Education, and Employment, Population and Housing Census (National Statistical Office), Population and Household Register (National Statistical Office), and Sample Surveys.

According to the 2020 Population and Housing Census, the number of Mongolian citizens living abroad is 122,301. This marks a 14.2% increase compared to 2010. The proportion of citizens living abroad in the total population ranges from 3.7% to 3.9%, which is close to the world average of approximately 3.6%.

9 out of 10 people living abroad are of working age. Compared to 2010, there has been an increase in the number of people over 30. Additionally, there is a tendency for those who were students in 2010 to remain in their host countries. The number of children aged 0-14 has nearly doubled, which is attributed to families residing abroad for extended periods for study and self-employment.

However, there are notable disparities between reports from international organizations and Mongolia's foreign migration records. A large proportion of Mongolian citizens residing abroad are concentrated in a handful of countries. For instance, 40,000 citizens reside in South Korea, 19,200 in the United States, 8,800 in Japan, and 7,200 in Kazakhstan, collectively constituting over 60% of all citizens living abroad.

Figure 33: Mongolian Citizens Residing Abroad, by thousand people



Methodology: Uncertainty regarding the future trends of foreign migration remains high. While foreign migration may increase during challenging economic periods, it does not always reverse when the economy improves. The consulting team conducted calculations based on available data, recognizing the inadequacy of sources on foreign migration. Population projections by the United Nations focus on net migration rather than foreign migration. However, assuming constant net foreign migration over many years is unrealistic. Therefore, a long-term dynamic was created, projecting until 2035: the geometric average annual growth rate of foreign migration was estimated based on the difference between the 2010 and 2020 Population and Housing Census. This rate was then applied annually until 2035 to forecast foreign migration growth. Although our country has previously approved quotas for sending labor abroad, the numbers are relatively small. Given their inclusion in the calculation of foreign migration, the census-registered migration data was utilized for this estimation.

Projections for foreign migration: According to projections for foreign migration, the majority of the population migrating abroad consists of individuals of working age. For instance, as of 2020, 86.6% of all migrated citizens were of working age, and by 2035, this percentage is expected to remain relatively stable, reaching 83.4%.

Table 39: Estimates of International Migration, 2020-2035

Age group	2020	2025	2030	2035
0-4	3,509	3,061	2,669	2,324
5-9	6,272	8,817	12,399	17,438
10-14	5,755	7,340	9,371	11,968
15-19	7,262	6,471	5,774	5,160
20-24	16,060	14,264	12,679	11,280
25-29	19,954	19,579	19,218	18,869
30-34	19,820	21,529	23,413	25,492
35-39	14,176	14,607	15,052	15,510
40-44	11,083	13,138	15,608	18,579
45-49	8,798	12,805	18,663	27,243
50-54	5,140	8,519	14,160	23,596
55-59	2,647	5,119	9,923	19,272
60-64	1,080	2,038	3,858	7,323
65-69	396	616	961	1,507
70+	349	499	716	1,030
Total	122,301	138,402	164,464	206,591
15-64 years old	106,020	118,069	138,348	172,324

The most active participants in migration are individuals aged 25-34, indicating that young people with experience in specific fields and high productivity are engaging in migration. In other words, these working-age citizens will not contribute to Mongolia's labor market.

Without measures to reduce migration and encourage return migration, it is projected that migration will reach 206,600 by 2035, a 68.9% increase from 2020. According to international studies, the majority of migrants are part of the brain drain phenomenon, representing the

educated segment of the population. This implies that a portion of our labor force capable of increasing productivity will be transferred abroad.

Number and flow of citizens living and working abroad

This section outlines the count of citizens residing in foreign countries, the flow of foreign migration, and return flow. Refer to Annex 5 for a comprehensive explanation of the analysis methodology.

Results of statistical significance: The analysis presents the outcomes of equation evaluation. It reveals that countries with high GDP per capita tend to have a lower percentage of citizens living abroad. However, the impact of GDP per capita on population flow measures lacks statistical significance.

Table 40: Relationship between number of citizens residing abroad, migration flows and country's GPD

Variables	Coefficient (GDP per capita)	Standart Error (SE)	Adjusted R^2	Number of observations, N
Percentage of citizens residing abroad	-5.872*	2.913	0.798	61
Out-migration	6.642	4.609	0.844	147
In-migration/return migration	0.561	0.646	0.945	37
net migration	-0.712	1.670	0.780	26

Note: The table presents ordinary least squares method estimates. The dependent variables on the right side of the equation include GDP per capita, year, and country effects. Source: ILO. Period covered: 2000-2022.

The analysis indicates that countries with high employment rates tend to have a lower percentage of citizens living abroad. Interestingly, there is a negative correlation between the outflow of citizens and high employment rates. However, the relationship between the return flow and the net outflow of the population lacks statistical significance.

Table 41: Relationship between number of citizens residing abroad, migration flows and employment to population ratio

Variables	Coefficient (Employment to poptulation ratio)	Standart Error (SE)	Adjusted R^2	Number of observations, N
Percentage of citizens residing abroad	-0.125**	0.046	0.761	56
Out-migration	-0.122**	0.048	0.768	127
Return migration	0.020	0.026	0.944	37
net migration	-0.109	0.083	0.812	26

Note: This table presents ordinary least squares method estimates. The dependent variables on the right side of the equation include employment to population ratio, year, and country effects.
Source: ILO. Study period: 2000-2022.

The table below displays the results of evaluating GDP per capita growth and employment rate growth as the main explanatory variables. Subsequent to this, the following table confirms the findings from the preceding one. Specifically, it indicates that both the level and the growth of GDP per capita contribute to a decrease in the number of citizens living abroad.

Table 42: Relationship between number of citizens residing abroad, migration flows and, GDP growth in the last 5 years

Variables	Coefficient (Change in GDP per capita)	Standart Error (SE)	Adjusted R^2	Number of observations, N
Percentage of citizens residing abroad	-4.567*	2.551	0.791	61
Out-migration	-7.083	4.907	0.844	147
Return migration	0.595	0.563	0.946	37
net migration	-1.993	1.328	0.821	26

Note: This table presents estimations conducted using the ordinary least squares method. The dependent variables on the right side of the equation include GDP growth in the last 5 years, country fixed effects, and annual effects. Source: ILO. Period covered: 2000-2022.

The subsequent table presents more intriguing findings. It indicates that when a country's employment rate increases, there is a decrease in the number of citizens living abroad, foreign migration, and net flows.

Table 43: Relationship between number of citizens residing abroad, migration flows and, employment to population ratio growth in the last 5 years

Variables	Coefficient (changes in the employment to population ratio)	Standart Error (SE)	Adjusted R^2	Number of observations, N
Percentage of citizens residing abroad	-0.107*	0.057	0.688	50
Out-migration	-0.165***	0.039	0.729	111
Return migration	-0.021	0.013	0.951	37
net migration	-0.087*	0.040	0.852	26

Note: This table shows estimations using the ordinary least squares method. The right side of the equation includes employment to population ratio growth in the last 5 years, country fixed effects, and annual effects. Source: ILO. Period covered: 2000-2022.

The relatively low statistical significance in the last two rows of the previous tables may be attributed to the small number of return observations within the ILO data. Regarding the regressions utilized in the evaluation, it's noticeable that the corrected R^2 of the evaluation is relatively high. This can be attributed to two main factors: Firstly, the small number of observation points for these countries, and secondly, the inclusion of country regular effects in the estimation.

Based on the above results, the following conclusions can be drawn:

- The number of citizens living abroad tends to decrease when the GDP per capita and employment rate are high.
- Notably, gross and net outflows of citizens are inversely related to the employment rate.
- The lack of statistical significance in the relationship between the return flow of citizens from outside the country to the GDP per capita and employment rate may be due to the small number of observations, but it likely reflects the reality.
- When the sensitivity of the outflow to the GDP per capita and employment rate is higher than the sensitivity of the return flow, medium-term fluctuations within the country will increase the risk of losing citizens abroad. In other words, there is a risk that in the case of a decrease in the GDP per capita, especially the employment rate, citizens will not return in sufficient numbers when the indicators recover.

Foreign migration of the countries and GDP per capita: This section delves into the relationship between the outflow of citizens from countries and their gross domestic product (GDP) per capita. Our primary inquiry revolves around identifying the threshold at which countries' outflows begin to diminish concerning their level of development. While many researchers have posited that citizen outflow hinges on a country's economic conditions, empirical investigations utilizing recent quantitative data to explore this trend are sparse. The scarcity of compiled data by the International Labor Organization (ILO) on this matter exacerbates the challenge. This limitation arises because the data primarily encompasses countries with lower GDPs, rendering it inadequate for drawing conclusions regarding a broad spectrum of GDP disparity. A common obstacle encountered in studying foreign migration is the difficulty in directly comparing data from disparate sources. To address this challenge, we turned to the 2017-2021 American Community Survey (ACS)[2] data from the United States after eliminating several alternatives.

Our primary estimation sample comprised a total of 821,059 immigrants. Using this sample, we tracked the influx of immigrants from 2010 to 2021 for each country and juxtaposed it with the respective country's population in that year to gauge the level of immigration. Population figures for the countries were sourced from data provided by the ILO.

We used the following equation.

$$m_{i,t} = \frac{\exp\left(\beta_0 + \beta_1 y_{i,t} + \beta_2 y_{i,t}^2 + \eta_t\right)}{1 + \exp\left(\beta_0 + \beta_1 y_{i,t} + \beta_2 y_{i,t}^2 + \eta_t\right)}, \quad (2)$$

$m_{i,t}$-the country's migration rate per capita, $y_{i,t}$- the country's GDP per capita, and η_t- annual effect. Where,д i and t indexes represent the country and year.

The rationale behind employing this equation lies in the inherent advantage of the immigration rate, which consistently falls within the range of 0 and 1. Moreover, the parameters of the equation lend themselves to estimation through straightforward regression methods. Hence, we consider the following linear equation:

[2] Steven Ruggles, Sarah Flood, Matthew Sobek, Daniel Backman, Annie Chen, Grace Cooper, Stephanie Richards, Renae Rogers and Megan Schouweiler. *IPUMS USA: Version 14.0* [dataset]. Minneapolis, MN: IPUMS, 2023. **https://doi.org/10.18128/D010.V14.0**

$$\ln\left(\frac{m_{i,t}}{1-m_{i,t}}\right) = \beta_0 + \beta_1 y_{i,t} + \beta_2 y_{i,t}^2 + \eta_t + \epsilon_{i,t}, \quad (3)$$

$\epsilon_{i,t}$- residual member. For this analysis, we concentrated on countries where the GDP per capita is lower than that of the US for the respective years. Data spanning from 2010 to 2021 were utilized. The evaluation employed real GDP per capita figures (constant 2017 international $), assessed using Purchasing Power Parity data from the World Bank.

Equation (3) was applied to three distinct age groups, and the regression outcomes are presented in the table below. As per the estimation findings, immigration levels rise in correspondence with GDP per capita, yet they exhibit an inverse relationship with the square of GDP per capita. This inverse correlation implies that immigration rates follow an inverse U-shaped pattern.

Table 44: Immigration rate and GDP, regression results

Variables	Coefficient	Standart Error (SE)	Adjusted R^2	Number of observations, N
All age groups				
GDP per capita $(\mathbf{10^{-4}})$	1.539***	0.347	0.846	1801
GDP per capita$^2(\mathbf{10^{-8}})$	-0.233***	0.066		
15 and above age group				
GDP per capita $(\mathbf{10^{-4}})$	1.580***	0.344	0.852	1799
GDP per capita $^2(\mathbf{10^{-8}})$	-0.239***	0.065		
25 and above age group				
GDP per capita$(*\mathbf{10^{-4}})$	1.675***	0.339	0.872	1768
GDP per capita^2 $(*\mathbf{10^{-8}})$	-0.260***	0.065		

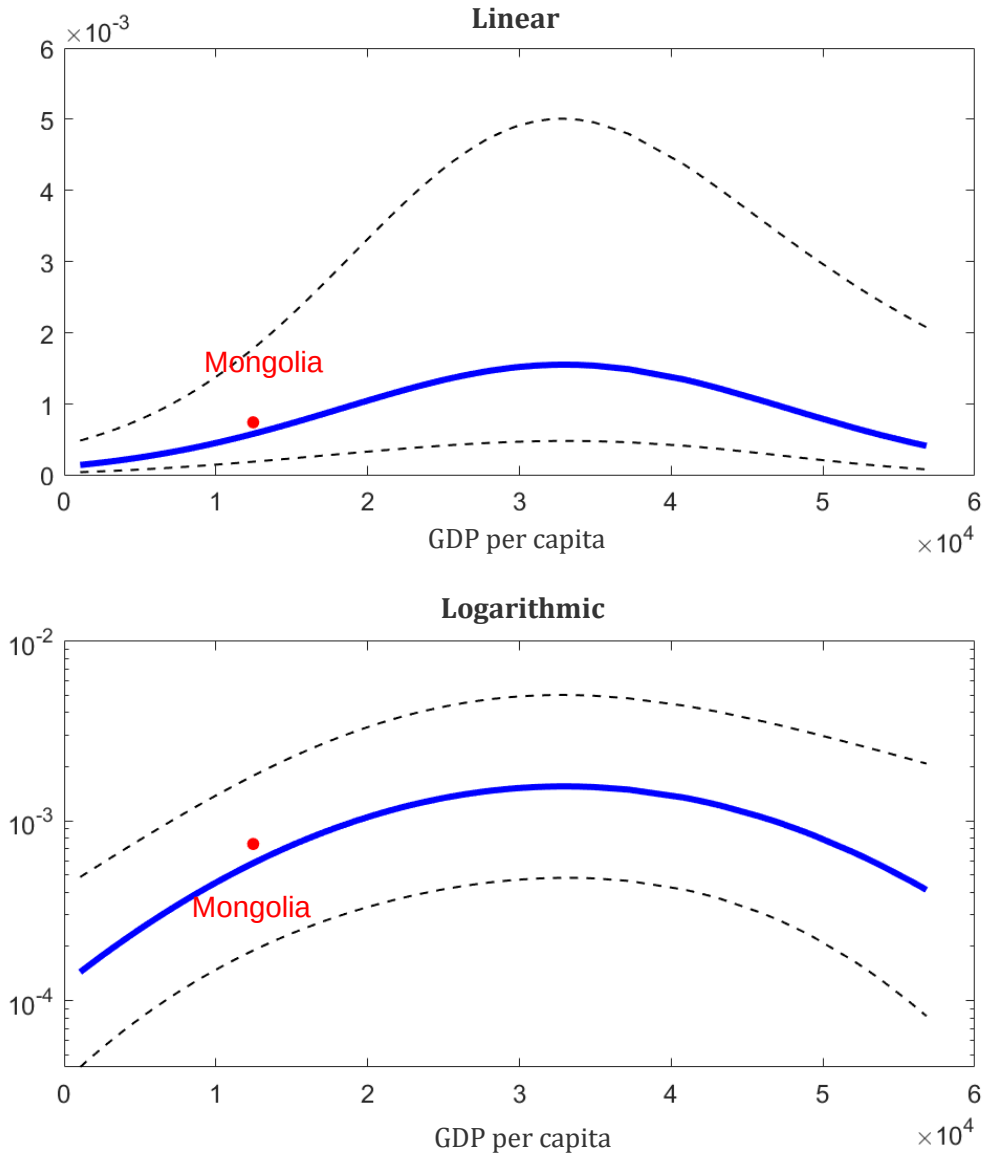
Source: ACS (American Community Survey) 2017-2021

The results depicted in the following figure pertain to the year 2019. The notable decline in emigration numbers in 2020 and 2021, likely influenced by the Covid pandemic, led us to select 2019 as a representative year unaffected by such disruptions. The graph illustrates that in 2019, when the GDP per capita of countries stood at 32,788.33 USD, immigration levels peaked. However, there appears to be a tendency for immigration levels to either rise or decline for more developed countries beyond this threshold. Mongolia's GDP per capita in 2019 was recorded at 12,458.02 USD (constant 2017 international $).

The primary inference drawn from this figure is that, on average, migration is expected to continue growing for countries with development levels similar to Mongolia's. Mongolia's projected GDP per capita is anticipated to nearly double to 13.3 thousand USD (at annual prices), resulting in a decrease in outflows. According to the Vision-2050 objective, Mongolia aims to achieve a GDP per capita of 12.1 thousand by 2030. Consequently, the foreign migration

of Mongolians is predicted to decline once it reaches levels comparable to those of Poland, Hungary, Latvia, Croatia, Turkey, and Malaysia. However, it's essential to acknowledge that this conclusion is solely based on GDP. Furthermore, the confidence interval depicted in the figure is wide, indicating that various other factors besides GDP per capita can influence foreign migration.

Figure 34: Relationship between immigration rate and GDP



Conditions of the foreigners working in Mongolia

Although Mongolia experiences a high level of foreign migration, it has also relied on foreign workers in specific sectors. The demand for foreign labor has increased due to economic growth, shortages of skilled labor in certain industries, and the necessity to augment work intensity. Moreover, post-COVID-19, the government's expansionary economic policies have further spurred the recruitment of foreign workers. In 2023, the number of foreigners employed under labor contracts nearly tripled compared to 2022, with the mining, construction, and education sectors employing the highest number of foreign workers. Please refer to the table below for details.

Table 45: Foreign workers with labor contract, by classifications of economic activities

Classifications of economic activity	2022-IV	2023-I	2023-II	2023-III
Total	3,943	5,740	11,210	12,223
Agriculture, forestry, fishing and hunting	45	49	75	134
Mining and quarrying	1,350	1,688	3,191	3,131
Processing industries	165	519	961	1,141
Electricity, gas, steam and air conditioning supply	24	46	141	430
Water supply; sewerage, waste management and remediation activities	1	1	1	1
Construction	229	651	2,852	3,195
Wholesale and retail trade; repair of motor vehicles and motorcycles	407	666	643	891
Transportation and storage	302	451	766	838
Accommodation and food service activities	65	124	155	146
Information and communication	26	31	37	39
Financial and insurance activities	17	19	23	26
Real estate activities	2	4	4	4
Professional, scientific and technical activities	6	10	17	14
Administrative and support service activities	4	4	5	5
Public administration and defence; compulsory social insurance	18	20	19	13
Education services	954	1,019	1,417	1,037
Health and social welfare	38	44	219	320
Arts, entertainment and recreation	5	35	70	94
Other service activities	166	220	458	431
Activities of households as employers	-	-	-	-
Activities of extraterritorial organizations and bodies	119	139	156	333

The table clearly illustrates how the resurgence of economic activity correlates with an increase in the foreign labor force. Hence, it becomes imperative to estimate the foreign labor force based on economic activity forecasts.

The number of foreigners employed in Mongolia experiences significant fluctuations, primarily influenced by economic growth and mining activities. Given the variability in our records, making accurate predictions is challenging. For instance, in 2018, just before the onset of the COVID-19 pandemic, the recorded number of foreign workers was 50,136. However, when categorized by economic activities, this number changed to 53,106 individuals.

Due to the sudden decline in the number of foreigners caused by COVID-19, along with incomplete registration and the absence of data on foreign labor force categorized by occupations and industries, forecasting foreign labor employment until 2035 is unfeasible. Therefore, it is essential to align with the activities outlined in development policy documents concerning foreign citizens and the Labor Migration Law (2021). Emphasis should be placed on attracting foreign labor possessing high technology skills.

When forecasting labor market demand and supply, potential differences can be determined by integrating estimations of economic conditions, industry growth and changes, labor force demand

and supply, population growth, and the influx and outflux of the labor force. These estimations can help gauge the influx of foreign labor accordingly.

CHAPTER 5

FORECASTING OF ENTRANTS AND GRADUATES OF SECONDARY SCHOOLS, TVETS AND UNIVERSITIES

5. FORECASTING OF ENTRANTS AND GRADUATES OF SECONDARY SCHOOLS, TVETS AND UNIVERSITIES

5.1 Current conditions of entrants, students and graduates of universities

In the academic year of 2022-2023, Mongolia had 69 universities, comprising 16 state-owned, 50 private, 3 public, and 1 foreign branch school. This reflects a reduction of 19 universities compared to the preceding academic year, a result of the government's policy aimed at merging state-owned universities and shuttering low-quality private institutions.

In terms of student enrollment, the academic year of 2022-2023 saw a total of 145,267 students across the country. Among them, 79,718 students (representing 54.9% of the total) were enrolled in state-owned universities. Although there was a 2.5% decrease in the total number of students compared to previous years, there was a slight uptick of 0.8% in the number of students attending state-owned institutions.

Table 46: General professional fields of students

Professional field	2020-2021	2021-2022	2022-2023
01. Education	19,162	18,244	18,053
02. Arts and humanities	12,128	11,461	10,950
03. Social sciences, journalism and information	9,390	8,687	9,001
04. Business, administration and law	47,761	42,955	41,008
05. Natural sciences, mathematics and statistics	3,902	3,532	3,434
06. Information and Communication Technologies	5,377	6,419	7,000
07. Engineering, manufacturing and construction	18,338	19,083	18,184
08. Agriculture, forestry, fisheries and veterinary	1,871	1,954	2,229
09. Health and welfare	22,693	26,054	26,058
10. Services	6,671	6,624	6,252
11. Others	-	3,941	3,098
Total	**147,293**	**148,954**	**145,267**

Source: Ministry of Education and Science

In the academic year of 2022-2023, the highest number of students were enrolled in business and law programs, accounting for 28.2% of the total student population. This was followed by health majors at 17.9%, and educational and engineering majors, each comprising 12.4% and 12.5% respectively. Over the past three years, there has been a consistent increase in the number of students majoring in agriculture, forestry, fisheries, and veterinary medicine, reaching 2,229 students (1.5% of the total), marking a 0.2 percentage point increase compared to the previous academic year.

Examining the changes in student numbers over the last three years across general majors, there have been no significant fluctuations; some majors have experienced slight increases while others have seen slight decreases.

Overall, in the academic year of 2021-2022, the total number of students increased by 1.1% to 148,954. However, in the subsequent academic year of 2022-2023, there was a decrease of

2.47%, bringing the total student population down to 145,627. This decline in total student numbers is attributed to the decrease in the number of new entrants.

Table 47: General professional field of the entrants

Professional field	2020-2021	2021-2022	2022-2023
01. Education	2,866	3,283	3,648
02. Arts and humanities	1,782	2,464	2,152
03. Social sciences, journalism and information	1,312	1,870	1,908
04. Business, administration and law	9,479	6,586	5,008
05. Natural sciences, mathematics and statistics	312	445	725
06. Information and Communication Technologies	1,004	1,655	1,618
07. Engineering, manufacturing and construction	3,470	3,724	3,656
08. Agriculture, forestry, fisheries and veterinary	157	192	255
09. Health and welfare	3,930	5,734	3,952
10. Services	853	1,488	1,438
11. Others	-	3,104	1,956
Total	**25,165**	**30,545**	**26,316**

Source: Ministry of Education and Science

In the academic year of 2021-2022, the number of entrants increased by 5,380 (21.4%) compared to the previous academic year, reaching 30,545. However, in the 2022-2023 academic year, there was a decrease of 4,229 (13.8%) to 26,316 entrants. During the academic year of 2022-2023, four general majors experienced increases (Education; Social sciences, journalism and information; Natural sciences, mathematics and statistics; and Agriculture, forestry, fisheries, and veterinary), while the remaining seven majors saw decreases, with the largest decline observed in Health and welfare.

Table 48: General professional field of graduates

Professional field	2019-2020	2020-2021	2021-2022
01. Education	5,590	6,296	6,001
02. Arts and humanities	1,451	2,127	2,317
03. Social sciences, journalism and information	1,305	1,804	1,901
04. Business, administration and law	9,766	9,794	10,506
05. Natural sciences, mathematics and statistics	353	864	767
06. Information and Communication Technologies	789	887	882
07. Engineering, manufacturing and construction	4,412	4,061	4,225
08. Agriculture, forestry, fisheries and veterinary	743	407	348
09. Health and welfare	3,276	3,661	4,293
10. Services	360	1,260	1,685
11. Others	**28,045**	**31,161**	**32,925**

Source: Ministry of Education and Science

As of the academic year of 2021-2022, there has been a consistent increase in the number of graduates across general majors each year. However, this growth has not been uniform across

all industries. For instance, the number of graduates in agriculture, forestry, fisheries, and veterinary medicine decreased nearly twofold from 743 to 348 over a span of three years.

According to statistics released by the Ministry of Education and Science (MES), majors in business, management, and law consistently attract the largest number of students, entrants, and graduates, despite witnessing a decrease in student numbers annually. Conversely, while agriculture remains a critical sector for the country's production, it has seen a positive trend in increasing enrollments and student numbers, despite having relatively few students and graduates.

In the professional field of engineering, manufacturing, and construction, both student numbers and entrants for the academic year 2022-2023 did not reach the levels of the previous year.

5.2. Forecasting of entrants and graduates of secondary schools, TVETs and universities

The results of the forecasting of graduates from secondary schools, TVETs, and universities, estimated using the above forecasting methodology, are presented in the table below.

Table 49: Forecasting of entrants and graduates of secondary schools, TVETs and universities up to 2035

	2025	2030	2035
Number of students who can graduate from general education school	35,640	67,428	79,476
Forecasted Enrollment in technical and vocational educational institution after 9th grade	7,966	13,155	15,506
Forecasted Enrollment in technical and vocational educational institution after 12th grade	3,930	5,985	7,055
Forecast of entrants from Non-General Education School Graduates	8,691	13,982	16,481
Forecast of Total Enrollment in in technical and vocational educational institution	20,587	33,123	39,041
Forecast of graduates from general education schools	35,640	54,273	63,970
Forecast of entrants to Universities following graduation from general education schools	27,336	41,627	49,065
Forecast of university enrollment using the ratio of total to general education school graduates	38,610	58,795	69,301
Forecast of total graduates from university	29,633	45,125	53,189
Forecast of total graduates from technical and vocational educational institution	19,347	31,127	36,689

According to estimates, a total of 620,998 students will graduate from secondary schools by 2035, with 33,045 expected in 2024, increasing to 63,970 in 2035, apart from a slight dip in 2029. This indicates a 1.9-fold increase in graduates compared to 2024.

In comparison to 2024, the number of university and TVET graduates is projected to increase by 1.8-1.9 times by 2035, indicating an accelerated growth rate of graduates from the previous level.

Historically, Mongolia's economy has taken an average of 5 years to double in nominal terms since 2008, with slow growth in the labor force due to low real GDP growth. With potential increases in real GDP in the future, there will likely be a need to expand the labor force, necessitating close coordination with the rising number of graduates.

Forecasting of majors for 2024-2035 was based on the projected number of university graduates. Absent significant policy changes, Commerce and Business administration graduates are expected to comprise 25% of all graduates (1 in 4 graduates).

Table 50: Forecast of the professional field of the university graduate

Professional field	2025	2030	2035
Total	29,633	45,125	53,189
Teacher, educational studies, pedagogy	4,610	7,021	8,275
Humanities	1,680	2,559	3,016
Arts	676	1,029	1,213
Law	2,089	3,181	3,749
Social sciences	1,897	2,889	3,405
Business, administration	7,305	11,124	13,112
Information	394	600	707
Mathematics and statistics, computer	884	1,347	1,587
Services	1,530	2,329	2,746
Natural sciences	714	1,088	1,282
Health and welfare	3,005	4,576	5,394
Engineering	3,012	4,587	5,407
Architecture and construction	815	1,242	1,464
Agriculture, forestry, fisheries and veterinary	653	995	1,173
Others	362	552	651

Further, when increasing the number of students in demanded and priority majors as outlined in the long-term development document, adjustments to the major structure can be made through promotional efforts, scholarships, and enhanced job availability post-graduation. However, it's also crucial to prepare a response plan in anticipation of potential shifts in majors resulting from the creation or disappearance of jobs associated with the changes brought about by the 4th industrial revolution.

CHAPTER 6
FORECASTING OF MID-TERM LABOR MARKET DEMAND AND SUPPLY

6. FORECASTING OF MID-TERM LABOR MARKET DEMAND AND SUPPLY

6.1. Forecasting of labor market supply

Forecasting of labor force participation rate

Estimates of the working-age population have been detailed in the preceding section. Despite the significance of the working-age population as a pivotal indicator in the labor market, the labor force participation rate (LFPR) is witnessing a persistent decline. The research team regards LFPR as a modifiable variable and projects it across three scenarios:

1. Maintaining the 2022 rate into the future.
2. Upholding the historical trend.
3. Achieving the targets outlined in Vision 2050 and Mongolia's Long-term Development Policy.

Under these scenarios, the LFPR is expected to evolve as follows:

- Following the trend, LFPR is slated to continue its descent, hitting a three-decade low at 57.7% in 2025, 56.0% in 2030, and 54.4% in 2035.
- Conversely, the aspirations outlined in the Vision 2050 policy present a relatively optimistic outlook. With LFPR targets set at 63% in 2025, 65% in 2030, and 70% in 2050, maintaining a consistent growth trajectory would see LFPR reach 66.3% by 2035.

Table 51: Labor force participation rate, 2024-2035

Year	Maintain the labor force participation rate at the 2022 level	In trend	With Vision 2050 goals
2024	58.6%	58.0%	61.5%
2025	58.6%	57.7%	63.0%
2026	58.6%	57.4%	63.4%
2027	58.6%	57.0%	63.8%
2028	58.6%	56.7%	64.2%
2029	58.6%	56.4%	64.6%
2030	58.6%	56.0%	65.0%
2031	58.6%	55.7%	65.3%
2032	58.6%	55.4%	65.5%
2033	58.6%	55.0%	65.8%
2034	58.6%	54.7%	66.0%
2035	58.6%	54.4%	66.3%

For each of the three LFPR versions, the labor force projections stand as follows:

1. If the LFPR remains stable at the 2022 level, the labor market supply is anticipated to reach 1,430.5 thousand in 2025, 1,583.7 thousand in 2030, and 1,739.1 thousand in 2035.
2. In the second version, where LFPR follows the calculated trend, the total labor market supply is projected to be 1,408.5 thousand in 2025, 1,514.6 thousand in 2030, and 1,613.9 thousand in 2035.

3. Under the third version, with a high LFPR, the labor supply is also high. Consequently, by 2035, the labor supply is estimated to reach 1,966.1 thousand, exceeding the trend forecast by 352 thousand and the 2022 level forecast by 227 thousand.

Table 52: Labor force forecasting, thousand people, 2024-2035

Year	Maintain the 2022 level	In trend	With Vision 2050 goals
2024	1,406.0	1,392.3	1,476.4
2025	1,430.5	1,408.6	1,537.9
2026	1,457.6	1,426.9	1,577.0
2027	1,486.9	1,447.2	1,618.8
2028	1,518.1	1,469.0	1,663.1
2029	1,550.5	1,491.6	1,709.3
2030	1,583.7	1,514.6	1,756.7
2031	1,617.0	1,537.3	1,800.5
2032	1,649.9	1,559.2	1,844.2
2033	1,681.7	1,579.8	1,886.9
2034	1,711.7	1,598.3	1,927.9
2035	1,739.1	1,614.0	1,966.1

Unemployment rate

To ascertain the number of workers in the labor market, forecasting the unemployment rate is essential. The consulting service team regards the unemployment rate as an adjustable variable, aligning it with the objectives outlined in the Vision 2050 document. This document aims to sustain the unemployment rate at 7.8% by 2025, 7.0% by 2030, and eventually reduce it to 3.0% by 2050. Consequently, the targeted unemployment rate for 2035 is set at 6.0%.

Table 53: Goals of the unemployment rate set in Vision 2050

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Unemployment rate, percent	7.4	7.8	7.6	7.5	7.3	7.2	7.0	6.8	6.6	6.4	6.2	6.0

The unemployment rate serves as a metric indicating the percentage of unemployed individuals in the labor force. Accordingly, based on the targeted unemployment rate, the projected number of unemployed individuals in the forthcoming years is as follows. Given the ambitious LFPR outlined in the Vision 2050 objectives, the corresponding increase in the number of unemployed citizens is anticipated. Overall, it is estimated that between 96,800 and 123,000 individuals will be unemployed in the ensuing years.

Table 54: Forecasting of unemployed citizens, thousand people, 2024-2035

Year	Maintain the 2022 level	In trend	With Vision 2050 goals
2024	104.5	103.5	109.7
2025	111.6	109.9	120.0
2026	111.4	109.0	120.5
2027	111.2	108.3	121.1
2028	111.1	107.5	121.7
2029	111.0	106.8	122.4

2030	110.9	106.0	123.0
2031	110.0	104.5	122.4
2032	108.9	102.9	121.7
2033	107.6	101.1	120.8
2034	106.1	99.1	119.5
2035	104.3	96.8	118.0

Forecasting of employees

With the figures for employed and unemployed citizens for the forthcoming years established, determining the total number of workers becomes straightforward. As depicted in the table below, it is projected that between 1.6 million and 1.8 million individuals will be active in the labor market by 2035. Nonetheless, it's important to note that this outcome is subject to variation based on the labor force participation rate.

Table 55: Forecast of the number of employees, thousand people, 2024-2035

Year	Maintain the 2022 level	In trend	With Vision 2050 goals
2024	1,301.5	1,288.9	1,366.6
2025	1,319.0	1,298.7	1,418.0
2026	1,346.2	1,317.9	1,456.5
2027	1,375.7	1,339.0	1,497.7
2028	1,406.9	1,361.4	1,541.4
2029	1,439.5	1,384.8	1,586.9
2030	1,472.9	1,408.6	1,633.7
2031	1,507.1	1,432.7	1,678.1
2032	1,541.0	1,456.3	1,722.5
2033	1,574.1	1,478.7	1,766.2
2034	1,605.6	1,499.2	1,808.4
2035	1,634.8	1,517.1	1,848.2

6.2. Forecasting of labor market demand

Number of workers required in Mongolia

The consulting team conducted an estimation of the employment coefficient necessary to meet the GDP target, drawing on data from the past 30 years and population pyramids of 229 countries worldwide. The methodology employed is elaborated in Annex 1. Two versions of GDP forecasting were developed, and the employment sensitivity coefficient was assessed for each version.

According to the mixed scenario, real GDP is anticipated to reach the target outlined in the "Vision-2050" policy document. If the average annual growth rate stands between 7.2% to 7.3%, it is projected to reach 70,477.5 million MNT by 2035. Conversely, based on the quadratic model, it is estimated to amount to 53,049.3 million MNT, with an average annual growth rate of 4.9%. The forecast also incorporates the calculation of the demographic load, with population projections detailed in the preceding section.

As previously mentioned, the total workforce required to attain the GDP target is outlined in the table below. For instance, by 2035, 1,862.5 thousand individuals will need to be employed to realize the Vision-2050 target. However, if the current growth trajectory persists and GDP follows a quadratic trend, the country will require a total of 1,794,200 workers. The table illustrates that the number of employees is projected to increase by 2.1% to 2.9% annually. It's worth noting that this forecasting represents a point estimate, with corresponding 95% confidence intervals available in the methodological notes provided in Annex 1.

Table 56: The number of required employees, thousands of people, and GDP in two scenarios

Year	GDP per capita growth, by quadratic trend model	GDP per capita growth, by mixed trend model	GDP quadratic growth	GDP mixed growth
2024	1,376.0	1,384.4	2.1%	2.4%
2025	1,406.9	1,419.8	2.2%	2.6%
2026	1,440.5	1,458.1	2.4%	2.7%
2027	1,476.6	1,499.1	2.5%	2.8%
2028	1,514.9	1,542.4	2.6%	2.9%
2029	1,554.8	1,587.5	2.6%	2.9%
2030	1,595.7	1,634.0	2.6%	2.9%
2031	1,637.1	1,681.0	2.6%	2.9%
2032	1,678.3	1,728.1	2.5%	2.8%
2033	1,718.8	1,774.7	2.4%	2.7%
2034	1,757.7	1,819.8	2.3%	2.5%
2035	1,794.2	1,862.5	2.1%	2.3%

Number of required workers, by industries

The table below illustrates the projected number of workers required in Mongolia until 2035, categorized by industries. These projections are based on two different GDP forecasts developed by the consulting team, with the structural analysis drawn from NSO data on the labor force spanning from 2009 to 2022. It's important to note that these results do not factor in the impact of policy shocks.

In terms of quantity, the manufacturing industry is anticipated to experience the highest increase, requiring an additional 62.9 thousand workers between 2024 and 2035. Following closely, the construction industry is expected to necessitate an increase of 60.1 thousand workers, while the trade industry may require an additional 45.8 thousand workers. Furthermore, the education industry is projected to see a rise of 36.6 thousand workers. However, despite these increases, the agriculture, forestry, and fishing sectors are forecasted to require 314.9 thousand workers by 2035, marking a decrease of 6.1 thousand compared to 2024.

Table 57: The number of required employees, by sector, thousand people, by quadratic trend of GDP forecast

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Agriculture, forestry, fishing and hunting	319.7	319.2	319.1	319.4	319.9	320.5	321.0	321.2	321.0	320.3	318.9	316.6
Mining and quarrying	69.2	71.7	74.3	77.0	79.9	82.9	85.9	89.0	92.2	95.4	98.6	101.7
Manufacturing	120.8	125.4	130.3	135.5	141.0	146.7	152.6	158.7	164.8	171.0	177.2	183.3
Electricity, gas, steam, air conditioning supply	23.5	24.6	25.7	26.9	28.1	29.4	30.8	32.2	33.7	35.1	36.6	38.1
Water supply; sewerage, waste management and remediation activities	8.8	8.9	9.1	9.2	9.4	9.6	9.8	9.9	10.1	10.3	10.4	10.6
Construction	96.8	100.8	105.1	109.8	114.7	119.9	125.2	130.7	136.3	141.9	147.4	152.7
Wholesale and retail trade; repair of motor vehicles and motorcycles	190.2	193.6	197.4	201.5	205.7	210.2	214.6	219.0	223.2	227.0	230.5	233.4
Transportation and storage	71.8	72.0	72.3	72.7	73.1	73.6	74.0	74.3	74.6	74.8	74.9	74.7
Accommodation and food service activities	41.8	43.1	44.6	46.2	47.9	49.6	51.4	53.2	55.0	56.7	58.4	60.0
Information and communication	20.0	20.6	21.3	22.0	22.8	23.6	24.4	25.2	26.1	26.9	27.7	28.4
Financial and insurance activities	33.5	35.3	37.3	39.3	41.6	43.9	46.4	49.0	51.7	54.4	57.2	60.0
Real estate activities	2.8	3.2	3.5	3.9	4.4	4.9	5.5	6.1	6.8	7.6	8.5	9.5
Professional, scientific and technical activities	16.7	17.2	17.7	18.2	18.8	19.4	20.0	20.6	21.3	21.9	22.4	23.0
Administrative and support service activities	23.3	24.6	26.1	27.7	29.4	31.2	33.1	35.1	37.1	39.3	41.4	43.6
Public administration and defence; compulsory social insurance	103.8	107.4	111.3	115.3	119.4	123.8	128.2	132.8	137.4	142.0	146.6	151.2
Education services	122.0	125.0	128.2	131.6	135.2	138.8	142.5	146.2	149.9	153.5	157.0	160.2
Human health and social work activities	59.5	61.0	62.6	64.3	66.0	67.8	69.6	71.4	73.2	75.1	76.9	78.6
Arts, entertainment and recreation	15.4	16.0	16.8	17.6	18.4	19.3	20.2	21.2	22.1	23.1	24.1	25.1
Other service activities	36.5	37.2	37.8	38.5	39.1	39.8	40.5	41.1	41.8	42.5	43.2	43.8

The table below outlines the required number of workers by industries to attain the real GDP targets outlined in Vision 2050. To meet this objective, the manufacturing industry must augment its workforce by 69.2 thousand between 2024 and 2035.

Table 58: The number of required employees, by sector, thousand people, by mixed trend of GDP forecast

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Agriculture, forestry, fishing and hunting	319.4	318.6	318.2	318.1	318.0	318.0	317.7	317.1	316.0	314.3	311.8	308.3
Mining and quarrying	69.2	71.6	74.1	76.7	79.5	82.2	85.1	87.9	90.8	93.7	96.5	99.1
Manufacturing	121.9	127.1	132.6	138.5	144.6	150.9	157.4	164.0	170.8	177.6	184.3	190.9
Electricity, gas, steam, air conditioning supply	23.9	25.1	26.5	27.9	29.4	31.0	32.6	34.3	36.1	37.9	39.7	41.5
Water supply; sewerage, waste management and remediation activities	8.6	8.7	8.7	8.8	8.9	8.9	9.0	9.0	9.1	9.1	9.1	9.1
Construction	100.1	106.1	112.5	119.4	126.8	134.7	142.9	151.5	160.4	169.5	178.7	187.9
Wholesale and retail trade; repair of motor vehicles and motorcycles	193.0	197.9	203.1	208.6	214.4	220.3	226.2	232.1	237.7	243.0	247.8	252.0
Transportation and storage	71.2	71.1	71.1	71.1	71.1	71.1	71.1	71.0	70.8	70.5	70.0	69.4
Accommodation and food service activities	43.1	45.2	47.4	49.8	52.4	55.0	57.8	60.7	63.6	66.5	69.3	72.1
Information and communication	20.4	21.3	22.2	23.2	24.3	25.4	26.5	27.7	28.8	30.0	31.1	32.2
Financial and insurance activities	34.8	37.4	40.2	43.2	46.5	50.1	53.9	57.9	62.1	66.6	71.1	75.9
Real estate activities	2.9	3.2	3.6	4.1	4.6	5.2	5.8	6.5	7.3	8.2	9.2	10.3
Professional, scientific and technical activities	16.9	17.5	18.2	18.9	19.6	20.4	21.1	21.9	22.7	23.5	24.2	24.9
Administrative and support service activities	24.3	26.3	28.5	30.9	33.6	36.4	39.5	42.7	46.2	49.9	53.8	57.8
Public administration and defence; compulsory social insurancy	103.7	107.2	110.9	114.7	118.6	122.6	126.7	130.8	135.0	139.0	143.0	146.9
Education services	121.8	124.7	127.8	130.9	134.2	137.5	140.8	144.1	147.2	150.3	153.1	155.6

Human health and social work activities	58.3	59.2	60.1	61.1	62.0	62.9	63.8	64.7	65.5	66.3	67.0	67.6
Arts, entertainment and recreation	15.7	16.6	17.6	18.6	19.7	20.9	22.1	23.4	24.7	26.1	27.4	28.8
Other service activities	35.0	34.9	34.7	34.5	34.3	34.0	33.8	33.5	33.2	32.9	32.6	32.3

Number of required workers, by 88 subsectors

The estimation of required workers was conducted by subdividing economic activity into 88 sub-sectors across two countries. Between 2024 and 2035, projections were made for these sub-sectors to determine the workforce needs.

According to the mixed trend, 1,384.5 thousand workers are needed by 2024 to fulfill the targets outlined in the Vision 2050 policy document. By 2035, this figure rises to 1,862.5 thousand workers, indicating a gap of 478.1 thousand workers that need to be supplied to the labor market between 2024 and 2035. However, this number may change based on factors such as retiring workers. Policies for supplying these workers to the labor market may include training new graduates, tapping into the existing labor market, and outsourcing.

As previously noted, the manufacturing industry has the highest demand for workers. Sub-sectors such as food production, clothing production, non-ferrous mineral products, and textile production require significant additional labor. In the mining sector, additional workers are needed for activities like metal ore mining and stone and lignite mining. Further analysis will be conducted to determine the proportion of these workers required from universities, vocational training institutions, and general education, which will be discussed in the next section.

Number of required workers, by provinces

The projection for the required workers in Mongolia until 2035 is presented by provinces, based on two different GDP forecasts.

The consulting team analyzed NSO data from 2009 to 2022 on the labor force, determining the structure of workers in provinces at the country level and disseminating the results. Given the high statistical data for the provinces, it was most appropriate to determine the structure of workers in the provinces based on trends. The dissemination was conducted under the condition that the structure of 2022 would be maintained. It's important to note that the results below do not consider the impact of policy shocks.

Table 59: The number of required employees, by province

	GDP forecast, by quadratic trend model			GDP forecast, by mixed trend model		
	2025	**2030**	**2035**	**2025**	**2030**	**2035**
Ulaanbaatar	637.3	722.8	812.7	643.1	740.1	843.6
Dornod	33.2	37.6	42.3	33.5	38.5	43.9
Sukhbaatar	30.4	34.5	38.8	30.7	35.3	40.3
Khentii	42.0	47.6	53.5	42.3	48.7	55.5

Tuv	41.8	47.4	53.2	42.1	48.5	55.3
Govisumber	6.4	7.3	8.2	6.5	7.4	8.5
Selenge	25.7	29.1	32.7	25.9	29.8	34.0
Dornogovi	32.2	36.5	41.1	32.5	37.4	42.6
Darkhan-Uul	37.1	42.1	47.4	37.5	43.1	49.2
Umnugovi	35.0	39.7	44.7	35.4	40.7	46.4
Dundgovi	28.2	32.0	36.0	28.5	32.8	37.3
Orkhon	38.0	43.1	48.4	38.3	44.1	50.3
Uvurkhangai	56.5	64.1	72.0	57.0	65.6	74.8
Bulgan	29.3	33.2	37.3	29.6	34.0	38.8
Bayankhongor	45.9	52.0	58.5	46.3	53.3	60.7
Arkhangai	53.3	60.5	68.0	53.8	61.9	70.6
Khuvsgul	51.4	58.4	65.6	51.9	59.8	68.1
Zavkhan	30.8	34.9	39.3	31.1	35.8	40.8
Govi-Altai	22.2	25.2	28.4	22.4	25.8	29.4
Bayan-Ulgii	51.1	57.9	65.1	51.6	59.3	67.6
Khovd	43.5	49.4	55.5	43.9	50.6	57.6
Uvs	35.7	40.5	45.5	36.0	41.4	47.2
Total	1,406.9	1,595.7	1,794.2	1,419.8	1,634.0	1,862.5

The table above indicates that the majority (over 45%) of all required workers in Mongolia are needed in Ulaanbaatar city. However, the impact of the "Urban-Rural Revival Policy" is not estimated in this projection due to the limited availability of past quantitative data, making it challenging to assess.

Number of required workers, by occupations

The number of workers required in Mongolia until 2035 was calculated according to the National Occupational Classification and Definition (ISCO-08). It was developed based on 2 different GDP forecasts.

We analyzed the NSO data from 2009 to 2022 on the labor force, determined the industry-occupation structure at the country level, and disseminated the results. It's important to note that the results below do not consider the impact of policy shocks.

If we assume that the real GDP will maintain the current growth rate and increase in a quadratic trend, it is estimated that by 2035, Mongolia will need 336.1 thousand Professionals, 311.9 thousand Skilled agriculture, forestry, and fishing workers, 297.3 thousand Services and sales workers, 248.3 thousand Craft and related trades workers, 156.5 thousand Plant and machine operators, and assemblers, and 157.5 thousand Elementary occupations. Between 2024 and 2035, the occupation that will experience the highest increase is Professionals, which is expected to rise by 98.2 thousand. However, the number of Skilled agriculture, forestry, and fishing workers is projected to decrease by 2.0 thousand during this period.

Table 60: The number of required employees, by occupation, in thousands, by quadratic trend of GDP forecast

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Manager	91.6	94.6	97.9	101.4	105.0	108.9	112.8	116.9	121.0	125.2	129.3	133.3
Professionals	237.9	245.3	253.2	261.5	270.3	279.3	288.7	298.2	307.9	317.5	327.0	336.1
Technicians and associate professionals	56.1	58.0	60.0	62.1	64.3	66.6	69.0	71.5	74.0	76.5	79.1	81.6
Clerical support workers	42.0	43.5	45.0	46.7	48.5	50.3	52.2	54.2	56.2	58.2	60.1	62.1
Services and sales workers	226.8	232.2	238.0	244.2	250.8	257.6	264.6	271.5	278.4	285.1	291.4	297.3
Skilled agricultural, forestry and fishery workers	314.0	313.5	313.5	313.9	314.5	315.2	315.8	316.1	316.0	315.4	314.1	311.9
Craft and related trades workers	167.3	173.3	179.7	186.5	193.6	201.1	208.9	216.8	224.8	232.8	240.7	248.4
Plant and machine operators, and assemblers	122.0	124.6	127.4	130.4	133.5	136.8	140.2	143.6	147.0	150.3	153.5	156.5
Elementary occupations	111.7	115.1	118.7	122.6	126.7	131.0	135.4	139.9	144.4	148.9	153.3	157.5
Armed forces occupations	6.4	6.6	6.8	7.1	7.3	7.6	7.9	8.2	8.4	8.7	9.0	9.3

The following occupations are essential for facilitating real GDP growth in a mixed trend:

Table 61: The number of required employees, by occupation, in thousands, by mixed trend of GDP forecast

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Manager	92.7	96.4	100.3	104.6	109.0	113.7	118.5	123.6	128.7	133.9	139.1	144.2
Professionals	238.9	246.8	255.2	264.1	273.5	283.2	293.2	303.4	313.7	324.1	334.3	344.2
Technicians and associate professionals	56.3	58.3	60.4	62.7	65.0	67.5	70.0	72.6	75.3	78.0	80.7	83.4
Clerical support workers	42.6	44.3	46.2	48.2	50.4	52.6	55.0	57.4	60.0	62.5	65.1	67.6
Services and sales workers	229.3	236.0	243.2	250.8	258.9	267.2	275.8	284.4	292.9	301.3	309.4	316.9
Skilled agricultural, forestry and fishery workers	313.7	313.0	312.7	312.7	312.7	312.8	312.7	312.2	311.2	309.6	307.3	304.0
Craft and related trades workers	169.7	177.0	184.9	193.2	202.0	211.3	220.9	230.7	240.8	251.0	261.1	271.0
Plant and machine operators, and assemblers	122.1	124.7	127.5	130.5	133.7	137.0	140.4	143.8	147.1	150.4	153.6	156.5
Elementary occupations	112.5	116.4	120.6	125.0	129.6	134.5	139.5	144.7	149.9	155.1	160.3	165.3

Armed forces occupations	6.4	6.6	6.8	7.1	7.3	7.6	7.8	8.1	8.3	8.6	8.8	9.1

Number of required workers, by 43 sub-occupations

The number of workers required for achieving the goals outlined in Vision 2050, specifically under a mixed trend scenario, was estimated in the previous section. In this section, occupations required for these goals were developed by 43 sub-groups.

By 2035, 336.1 thousand specialists are required. This includes 98.3 thousand Teaching professionals, 77.4 thousand Business and administration professionals, 49.0 thousand Health professionals, as well as 130.6 thousand Drivers and mobile plant operators.

Table 62: The number of required employees, in sub 43 occupations, thousand people, by mixed trend of GDP forecast

Major		Sub-major groups		2024	2035	GAP	2024, percentage	2035, percentage
	Total			1384.3	1862.5	478.2	100.0%	100.0%
M1	Managers	SM4	Chief Executives, Senior Officials and Legislators	36.9	56.8	19.9	2.7%	3.0%
		SM5	Administrative and Commercial Managers	19.6	30.5	10.9	1.4%	1.6%
		SM6	Production and Specialized Services Managers	21.9	34.9	13.0	1.6%	1.9%
		SM7	Hospitality, Retail and Other Services Managers	15.7	24.2	8.5	1.1%	1.3%
M2	Professionals	SM8	Science and Engineering Professionals	43.7	69.0	25.4	3.2%	3.7%
		SM9	Health Professionals	40.3	49.0	8.8	2.9%	2.6%
		SM10	Teaching Professionals	75.2	98.3	23.1	5.4%	5.3%
		SM11	Business and Administration Professionals	49.1	77.4	28.2	3.6%	4.2%
		SM12	Information and Communications Technology Professionals	3.2	5.1	1.9	0.2%	0.3%
		SM13	Legal, Social and Cultural Professionals	28.2	46.5	18.3	2.0%	2.5%
M3	Technicians and Associate Professionals	SM14	Science and Engineering Associate Professionals	12.0	17.8	5.8	0.9%	1.0%
		SM15	Health Associate Professionals	7.9	9.9	2.0	0.6%	0.5%
		SM16	Business and Administration Associate Professionals	19.9	32.1	12.2	1.4%	1.7%
		SM17	Legal, Social, Cultural and Related Associate Professionals	9.5	13.6	4.2	0.7%	0.7%
		SM18	Information and Communications Technicians	2.4	3.8	1.4	0.2%	0.2%
M4	Clerical support workers	SM19	General and Keyboard Clerks	5.8	8.4	2.6	0.4%	0.5%
		SM20	Customer Services Clerks	15.0	28.4	13.4	1.1%	1.5%
		SM21	Numerical and Material Recording Clerks	15.4	22.9	7.5	1.1%	1.2%
		SM22	Other Clerical Support Workers	7.5	10.8	3.2	0.5%	0.6%
M5	Services and	SM23	Personal Services Workers	67.5	94.5	27.0	4.9%	5.1%

	sales workers	SM24	Sales Workers	140.1	183.3	43.1	10.1%	9.8%
		SM25	Personal Care Workers	7.3	8.8	1.5	0.5%	0.5%
		SM26	Protective Services Workers	20.3	34.1	13.9	1.5%	1.8%
M6	Skilled agricultural, forestry and fishery workers	SM27	Market-oriented Skilled Agricultural Workers	320.0	317.2	-2.8	23.1%	17.0%
		SM28	Market-oriented Skilled Forestry, Fishery and Hunting Workers	1.0	1.2	0.1	0.1%	0.1%
		SM29	Subsistence Farmers, Fishers, Hunters and Gatherers	3.0	3.1	0.0	0.2%	0.2%
M7	Craft and related trades workers	SM30	Building and Related Trades Workers (excluding Electricians)	57.1	100.0	43.0	4.1%	5.4%
		SM31	Metal, Machinery and Related Trades Workers	28.1	40.9	12.8	2.0%	2.2%
		SM32	Handicraft and Printing Workers	6.0	9.1	3.1	0.4%	0.5%
		SM33	Electrical and Electronic Trades Workers	22.0	33.6	11.6	1.6%	1.8%
		SM34	Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	41.3	63.3	22.0	3.0%	3.4%
M8	Plant and machine operators, and assemblers	SM35	Stationary Plant and Machine Operators	12.7	20.1	7.4	0.9%	1.1%
		SM36	Assemblers	1.6	2.4	0.8	0.1%	0.1%
		SM37	Drivers and Mobile Plant Operators	103.3	130.6	27.4	7.5%	7.0%
M9	Elementary occupations	SM38	Cleaners and Helpers	42.2	60.1	17.9	3.1%	3.2%
		SM39	Agricultural, Forestry and Fishery Laborers	1.2	1.3	0.1	0.1%	0.1%
		SM40	Laborers in Mining, Construction, Manufacturing and Transport 94 Food Preparation Assistants	31.2	49.9	18.7	2.3%	2.7%
		SM41	Food Preparation Assistants	3.3	4.9	1.6	0.2%	0.3%
		SM42	Street and Related Sales and Services Workers	1.6	2.2	0.6	0.1%	0.1%
		SM43	Refuse Workers and Other Elementary Workers	36.2	51.4	15.2	2.6%	2.8%
M10	Armed forces occupations	SM1	Commissioned Armed Forces Officers	2.4	3.3	0.9	0.2%	0.2%
		SM2	Non-commissioned Armed Forces Officers	3.4	4.6	1.3	0.2%	0.2%
		SM3	Armed Forces Occupations, Other Ranks	2.0	2.9	0.9	0.1%	0.2%

6.3. Estimates on how to prepare demanded workers. i.e. number of demanded workers by educational level

In order to devise strategies for future labor force preparation, it's crucial to examine the structure and educational attainment of past labor force cohorts. The Labor Force Survey (LFS) conducted by NSO serves as a key data source for this analysis.

Over the last decade, data from surveys conducted over both 5 and 10-year periods reveal insights into the educational levels of all workers. Results indicate that 2.8% of workers have no formal education, 5.3% have completed primary education, 12.8% have attained basic education, and 16.3% have achieved general education. This means that 37.3% of all workers have completed general or lower education levels, specifically having completed general schooling.

It's noteworthy that the high proportion of workers in the agricultural industry, at 79%, possessing general or higher education has impacted this indicator. Additionally, 30.4% of workers have vocational education, while 32.3% hold bachelor's degrees or higher qualifications.

Table 63: Employees, by education level

Education	Average of last 5 years (2018-2022 research results)	Average of last 10 years (2013-2022 research results)
Not educated	3.1%	2.8%
Primary	4.8%	5.3%
Lower secondry	11.8%	12.8%
Upper secondary	16.9%	16.3%
Technical and vocational	23.4%	24.3%
Specialized secondary	5.6%	6.1%
Diploma, Bachelor	31.5%	29.9%
Master	2.7%	2.2%
Ph.D	0.3%	0.2%
Total	**100%**	**100%**
Graduate from university	34.5%	32.3%
Graduated from technical and vocational educational institution.	29.0%	30.4%
Graduated from general education school	36.5%	37.3%

If we maintain the current education structure of employees, the educational attainment levels of those working in 2035 will be as follows:

Table 64: Employees' education level, by classifications of economic activities

Industries (row 100%)	University graduate	Vocational graduate	General school graduate
Agriculture, forestry and fishing	4%	17%	79%
Mining and quarrying	35%	**45%**	20%
Manufacturing	27%	**44%**	29%
Electricity, gas, steam, ventilation	40%	**43%**	18%
Water supply; sewage disposal systems, garbage and waste management and cleaning	21%	**47%**	32%
Construction	28%	**44%**	28%
Wholesale and retail trade, repair and service of cars and motorcycles	36%	33%	31%
Transportation and warehousing	21%	**58%**	21%
Hotels, housing and catering services	28%	**46%**	27%
Information and communication	77%	14%	9%

Finance and insurance	**86%**	8%	6%
Real estate	**85%**	10%	6%
Professional scientific and technical activities	**80%**	14%	6%
Administrative and support activities	46%	27%	27%
Public administration and defense, compulsory social security	62%	24%	13%
Education	66%	22%	13%
Human health and social welfare	55%	33%	12%
Arts, entertainment, games and festivals	59%	23%	19%
Other services	33%	**44%**	23%

According to the industry-occupation matrix, specific educational requirements vary across different sectors. For instance, in the agricultural industry, approximately 4% of workers should hold university degrees or bachelor's qualifications, 17% should have vocational training, and the remaining 79% can possess general school education. Contrastingly, the mining sector demands a higher proportion of workers with tertiary education, with 35% requiring university qualifications and 45% needing vocational or technical training, leaving 20% with general education backgrounds.

Industries such as finance, insurance, real estate, and professional scientific and technical services require a substantial percentage of workers with higher education, with over 80% of employees in these sectors possessing tertiary qualifications. Conversely, vocational institutions can prepare over 40% of workers in sectors like mining, manufacturing, construction, transportation, warehousing, hotels, housing, and catering services. Meanwhile, up to 30% of workers in industries other than agriculture may have completed general education.

The industry-occupation matrix also delineates the distribution of job roles within each sector. For example, in the education sector, 4.5% of employees are categorized as managers, while the majority, constituting 61.1%, are classified as specialists. These distinctions align with the International Standard Classification of Occupations (ISCO-08) and the International Standard Classification of Education (ISCED-97), which outline potential correlations between required skills and educational levels.

Within the ISCO-08 framework, specialists are identified as employees with competency level 4, involving tasks such as problem-solving, decision-making, and creative approaches based on theoretical and practical knowledge. This competency level typically corresponds to 3-6 years of study at higher education institutions, culminating in a bachelor's degree or higher. On the other hand, casual occupations are associated with competency level 1, representing workers with primary education who perform simple, repetitive physical and manual tasks.

In the educational industry, 15.6% of employees fall under the category of casual occupations. Refer to Annex 10 for further details regarding the ILO's characterization of this category.

Table 65: Employees' education level, by classifications of economic activities and occupation

Classifications of economic activities	Manager	Professionals	Technicians and associate professionals	Clerical support workers	Services and sales workers	Skilled agricultural, forestry and fishery workers	Craft and related trades workers	Plant and machine operators, and assemblers	Elementary occupations	Armed forces occupations
Agriculture, forestry, fishing and hunting	0.4%	0.2%	0.1%	0.1%	0.2%	97.7%	0.3%	0.4%	0.6%	0.0%
Mining and quarrying	7.3%	18.6%	3.4%	2.6%	5.3%	0.1%	10.6%	38.6%	13.6%	0.0%
Manufacturing	8.8%	8.6%	2.0%	1.9%	6.5%	0.9%	52.0%	8.9%	10.4%	0.0%
Electricity, gas, steam, air conditioning supply	4.7%	21.5%	8.6%	4.3%	2.5%	0.0%	30.7%	12.7%	15.0%	0.0%
Water supply; sewerage, waste management and remediation activities	5.1%	9.5%	6.5%	2.1%	3.5%	0.1%	11.5%	14.1%	47.5%	0.1%
Construction	8.1%	14.8%	1.4%	1.6%	2.3%	0.0%	49.1%	8.1%	14.5%	0.0%
Wholesale and retail trade; repair of motor vehicles and motorcycles	8.9%	5.8%	1.1%	1.1%	68.3%	0.1%	6.4%	2.7%	5.5%	0.0%
Transportation and storage	3.2%	5.2%	2.2%	4.4%	5.4%	0.0%	2.2%	73.4%	3.9%	0.0%
Accommodation and food service activities	13.8%	3.5%	1.3%	4.2%	58.0%	0.0%	1.6%	1.3%	16.4%	0.0%
Information and communication	14.2%	46.8%	8.1%	13.7%	3.6%	0.0%	6.3%	3.2%	4.0%	0.0%
Financial and insurance activities	18.3%	33.1%	8.3%	27.7%	2.9%	0.0%	0.3%	3.6%	5.8%	0.0%
Real estate activities	27.9%	20.7%	32.5%	0.0%	10.8%	0.0%	1.2%	0.0%	6.9%	0.0%
Professional, scientific and technical activities	12.6%	58.7%	15.9%	4.7%	1.1%	0.0%	1.2%	2.9%	2.9%	0.0%
Administrative and support service activities	18.2%	17.0%	3.3%	4.9%	29.1%	0.2%	3.9%	6.7%	16.7%	0.1%
Public administration and defence; compulsory social insurance	13.3%	24.3%	13.1%	10.4%	11.4%	0.3%	2.3%	6.6%	10.1%	8.1%
Education services	4.5%	61.1%	0.9%	3.1%	12.5%	0.0%	1.7%	0.5%	15.6%	0.0%
Human health and	3.4%	61.7%	7.9%	2.3%	9.0%	0.0%	1.9%	3.4%	10.3%	0.0%

social work activities										
Arts, entertainment and recreation	12.6%	44.7%	9.7%	5.8%	8.9%	0.5%	2.2%	1.2%	14.4%	0.0%
Other service activities	8.8%	12.7%	5.3%	2.4%	41.3%	0.4%	14.7%	3.0%	11.3%	0.0%
Total	6.4%	16.3%	2.9%	3.1%	16.9%	26.7%	10.4%	8.9%	7.8%	0.5%

In the manufacturing industry, a significant portion, accounting for 52% of all workers, are Craft and related trades workers. These roles typically require workers with competency level 2, as defined by the ILO. Competency level 2 encompasses various tasks such as operating machinery and electrical equipment, driving transport vehicles, repairing electrical and mechanical equipment, and organizing, classifying, and storing information.

According to the ILO's classifications, individuals at competency level 2 are expected to have technical and vocational education or have completed secondary education. Therefore, vocational training institutions play a crucial role in preparing workers for these occupations. Workers at competency level 2 should possess skills such as reading safety instructions, recording performed tasks, and performing basic arithmetic calculations. Moreover, many occupations at this level necessitate advanced literacy and numeracy skills, as well as effective communication abilities, which are integral to job performance. Additionally, a high level of manual dexterity is often required for most occupations at this competency level.

6.4. Estimates on demanded main professionals and skilled workers for industries

When determining the demand for specialists across various sectors and sub-sectors of economic activity, the following factors were considered:

- The main occupations required for the industry's operations, including Professionals (M2), Technicians and Associate Professionals (M3), Craft and Related Trades Workers (M7), and Plant and Machine Operators and Assemblers (M8), as defined by the ISCO-08 classification. Additionally, certain industries, such as hotel and restaurant management, include Managers who possess industry-specific knowledge and skills.
- Occupations such as Managers (M1), Clerical Support Workers (M4), Services and Sales Workers (M5), and Elementary Occupations (M9) were classified as non-major specialists due to their potential to transfer between occupations and industries within all economic sectors.
- Managers (M1), although not listed as main occupations, are recognized as requiring interdisciplinary general management skills. They can often be promoted from Professionals (M2) within the sector or from other occupations.

The main occupations for each economic sector and sub-sector were determined based on the following studies and documents:

1. Goals outlined in "Vision 2050: Long-term Development Strategy of Mongolia", as well as the New Revival Policy and policy documents from relevant line ministries.
2. Estimates of the total job creation expected from 94 projects listed in the Ministry of Economy and Development's database, including the number of permanent positions during both construction and operation phases.
3. Results of studies conducted by ministries such as the Ministry of Energy, Ministry of Digital Development and Communications, and the Ministry of Mining and Heavy Industry (specifically, the Department of Heavy Industry Policy and the Department of Petroleum Policy) regarding the supply and demand of human resources.
4. Priority professional areas identified in higher education, as outlined in Appendix 1 and Appendix 2 of Resolution No. 115 issued by the Government on March 29, 2023.
5. Statistics on students, entrants, and graduates of universities, as well as entrants to vocational institutions for the academic year 2022-2023.
6. Information gathered from entities operating within sectors and sub-sectors, including the number of workers, products and services offered, production growth trends, and calculations based on sector-specific specialists and researchers. This data may include interviews and presentations.
7. The number of available human resources, specialists, and qualified employees, along with professional requirements, industry standards, and operational standards necessary for obtaining special licenses to operate within the sector and sub-sector.

For each occupation, the calculation basis and data sources are provided. Detailed results can be found in Annex 8.

The following table presents projections for the demand for key specialists by 2030. According to the projections, by 2030, there is a total demand of 68.9 thousand specialists in the occupations of Professionals (M2), Technicians and Associate Professionals (M3), and 45.8 thousand skilled workers in the occupations of Craft and Related Trades Workers (M7), and Plant and Machine Operators and Assemblers (M8). Specifically for the manufacturing industry, it is necessary to train 5.4 thousand individuals in M2 and M3 occupations, along with 12.5 thousand workers in M7 and M8 occupations.

Table 66: Projections for the demand of the main specialits in economic sectors – up to 2023

Industry	Specialist, technician (M2, M3)	Skilled worker (M7, M8)	Total	Main occupation	Rationale (source)
Agriculture, forestry, fishing and hunting	15,855	3,230	19,085	Forest engineer and technician Veterinarian, Technician, Biotechnologist, Microbiologist Agronomist, operator and assembler of agricultural machinery and equipment	Billion Tree National Movement Vision 2050: Sustainable Agriculture Priority professional areas of higher education
Mining and quarrying	255	280	535	Coal and oil engineer, Concentration Engineer Consentration of rare earth elements Operator, mine base equipment	Industrial revival: Tavantolgoi and other coalfield projects 4.2.14. The mining deposit will be put into use, and the following high-tech heavy industry complexes will be built: • Lithium deposit; • Research and exploration of rare earth elements will be intensified
Manufacturing	5,354	12,484	17,838	Technological engineer, technician, laboratory worker; Engineering, all types; Designer and production; Machinery and equipment operators and assemblers	Industrial revival Vision 2050: Sustainable Agriculture Metalworking and oil projects Industrial technology park
Electricity, gas, steam and ventilation	393	1,040	1,433	Electrical engineer Electrician	Energy Revival: Ministry of Energy: Erdeneburen HPP, Tavantolgoi thermal power plant, expansion of Amgalan, Choibalsan thermal power plants, Booreljuut
Water supply, drainage systems, waste disposal and environmental restoration	190	308	498	Plumber, pipeline Engineering and water supply Technologist, waste treatment	"Blue Gold" National Water Industry Conference organized by the initiative of the President Ulaanbaatar City's New Central Treatment Plant and Wastewater Recycling Plant to be built

					as part of the MCA project
Construction	4,983	26,375	31,358	Construction engineer; Machinery and equipment operators and assemblers	Information on 95 projects in the database of the Ministry of Economy and Development New jobs created during construction
Wholesale and retail trade, repair and service of cars and motorcycles	670	900	1,570	Mechanic, engineer, car Mechanical engineering technician, car Mechanic, car	The number of cars is increasing every year and the car maintenance market is growing rapidly, which shows that there is a potential for more jobs in this industry
Transportation and warehousing	1,269	715	1,984	Engineers and technicians Motion planner specialist	Estimates of Ministry of Road Transport Development: New railways and expansion of airports + Transport logistics specialist, motion planner
Arts, Entertainment and Games	199	-	199	Lighting, Sound Technician, Librarian, Cultural Heritage Restoration	Ministry of Culture Number of professional art organizations and number of employees
Information and communication	1,505	-	1,505	Programmer, Electrical engineer, Hardware Engineer; Artificial intelligence robotics etc	Research by the Ministry of Digital Development and Communications
Professional, scientific and technical activities	250	-	250	Physicist, chemist, biotechnologist, laboratory technician	Research and analysis for the development of agriculture and processing industries Industrial park
Education	25,935	-	25,935	Kindergarten teachers 10,449 Primary school teachers 2,130 General school teachers 11,196 TVET teachers 2,107	Projections for Education Prospects 2020-2050 based on "Vision 2050: Long-Term Development Policy of Mongolia", MES, 2022
Human health and social welfare	12,043	500	12,543	Doctors 2,767 Nurses 9,276 Qualified nursing staff 500	"Mongolia Health Sector Human Resource Planning and Research Report until 2026", Ministry of Health, MNUMS, WHO, 2022)
Нийт	**68,901**	**45,832**	**114,733**		

CHAPTER 7
CONCLUSION

7. CONCLUSION

Main conclusion on labor market conditions

1. **While the labor force participation rate is decreasing, it remains consistent with the averages observed in countries with similar population structures and levels of economic development.**

   Over the past 20 years, the labor force participation rate has steadily declined, from 62.9% in 2000 to 58.6% nationwide by 2022. Comparatively, the global average stands at 59.8%, the Asia-Pacific average at 59.7%, and the average for low-middle income countries at 51.1%. According to an econometric analysis conducted using labor market data from the International Labor Organization (ILO), Mongolia's 2022 employment rate and labor force participation rate (LFPR) align with those of countries possessing similar population structures, levels of economic development, and growth trajectories.

2. **With significant migration to Ulaanbaatar city, there is a pressing need to generate employment opportunities in local areas.**

   Since 1990, the number of workers in local areas has seen minimal growth, contrasting sharply with Ulaanbaatar, where it has increased by 2.5 times. The primary driver for migration to Ulaanbaatar includes seeking employment opportunities, augmenting income, pursuing higher education, accessing healthcare services, and enhancing living standards. Consequently, prioritizing local development initiatives, enhancing infrastructure, fostering favorable living conditions, and promoting balanced regional development are imperative. Encouraging local employment opportunities is essential to stimulate interest and investment in local areas.

3. **The average duration of unemployment stands at 7.5 months, below the international average.**

   The duration of unemployment serves as a crucial metric in understanding the labor market dynamics. As it is inversely correlated with the probability of finding a job, a shorter duration implies that the average unemployed individual has a higher likelihood of securing employment. According to data from the International Labor Organization (ILO) in 2022, encompassing 69 countries in the sample, the average duration of unemployment stands at 8.7 months. This duration varies across countries, with figures such as 2.47 months in the Republic of Korea, 5.26 months in the United States, 8.3 months in the Russian Federation, 8.4 months in Kazakhstan, 8.8 months in Japan, and 14.7 months in Italy.

   In Mongolia, the duration of unemployment is recorded at 7.5 months, which is 1.2 months shorter than the average across other countries in the sample. In essence, this suggests that compared to the average country in the dataset, unemployed individuals in Mongolia secure employment relatively quickly.

4. **Mongolia's unemployment rate is on par with that of regional and comparable developed countries.**

   Unemployment is determined by the disparity between the labor force participation rate (LFPR) and the employment rate. Given that Mongolia's LFPR and employment rate align closely with those of similar countries, there exists no significant statistical difference in terms of the unemployment rate. According to the International Labor Organization's (ILO) data for 2022, Mongolia's unemployment rate stands at 6.2%. Comparatively, the unemployment rate for European and Central Asian countries is 6.1%, and for developed (lower-middle income)

countries similar to Mongolia, it is also 6.2%. This suggests that Mongolia's unemployment rate mirrors that of regional and comparable developed countries. In essence, Mongolia's LFPR, employment rate, and unemployment rate exhibit no significant deviation from the corresponding indicators of countries with similar population structures and levels of economic development, as well as from the regional average. Furthermore, the duration of unemployment in Mongolia is relatively shorter than the average observed in other countries.

5. **Real wages have experienced limited growth over the past decade.**
   While the duration to secure a job is 1.2 months less than the international average, real wages have not seen significant growth over the past decade. In the last 10 years, nominal wages have increased by 169%, real wages adjusted for the consumer price index have risen by 31%, and wages expressed in USD have climbed by 17%.

6. **The proportion of real wages in GDP is lower by 8.7-13.3 percentage points compared to similar countries.**
   Mongolia's economy, particularly its labor market, exhibits a notably low share of labor income in GDP. Analysis conducted using data from the International Labor Organization (ILO) reveals that Mongolia's share of labor income in GDP is 8.7-13.3 percentage points lower compared to countries with similar population structures and levels of development. Specifically, the share of labor income in Mongolia's GDP for the period of 2000-2020 was 33.4%. To align with the standards of other similarly developed countries, Mongolia would need to elevate this percentage to 45.9%-50.5%. (For reference: USA 60.4%, South Korea 59.7%, Japan 56.8%, Russia 54.3%, China 50.7%).
   Increasing the number of highly productive jobs stands as the primary means to bolster this figure.

7. **The informal economy has been on the rise.**
   The steep rise in prices significantly erodes citizens' purchasing power, prompting an increased inclination towards working in the informal sector rather than the formal one. As of 2022, 215 thousand citizens are employed in the non-agricultural sector, marking a 20.9% increase (37,300) since 2021 and a 10.3% rise (20,100) since 2019. Since 2010, Mongolia's non-agricultural informal economy has surged by 40% (215,400), with Ulaanbaatar witnessing an even steeper increase of 80% (124,300). A majority, 77%, of these workers are engaged in wholesale and retail trade, manufacturing, construction, transportation, and warehousing.
   Additionally, the high inflation rate in recent years, exacerbated by the impact of Covid, has driven individuals to seek additional income-generating opportunities. Consequently, there is a growing interest in informal sector employment and overseas employment. It is therefore imperative to clarify policies pertaining to the informal economy, including tax regulations and social insurance protocols.

8. **Recent labor shortages can be attributed to demographic factors.**
   Labor shortages cannot solely be attributed to wages and income; demographic factors also play a significant role. Statistics indicate that the period from 1991 to 2005 experienced the lowest birth rates, resulting in 15-20 thousand fewer children born annually compared to the average birth rate of the preceding 30 years. This cumulative effect amounts to a total of 250-300 thousand fewer children. These individuals, now aged between 18 and 33 years, constitute the primary demographic cohort in the labor market. The impact of this period of low birth rates is expected to persist until 2028. Furthermore, there is a nationwide trend

indicating an increase in the number of individuals aged 20-34 years old. Consequently, while the labor supply is projected to decrease until 2028, it is expected to gradually increase thereafter.

Another supporting statistic is the decline in the number of university graduates over the past five years. Over the last 13 years, an average of 32.2 thousand young people graduated from universities and colleges annually. However, this figure declined to 23 thousand in both 2018 and 2022. In essence, the decrease in birth rates between 1990 and 2005 will continue to impact the labor market by causing a decline in the number of young people entering the workforce over the next 3-5 years, thereby reducing the supply of new skilled and qualified personnel.

9. Interest in working abroad remains high with no indication of decreasing.

The domestic labor market faces the risk of declining new labor supply due to the low birth rate of the previous generation and further exacerbated by labor outflow. Presently, over 120,000 Mongolian citizens are employed abroad. A survey conducted among citizens aged 15-64 revealed that two-thirds expressed a desire to work abroad if given the opportunity. This sentiment is particularly pronounced among 25-34-year-olds, with 73% expressing interest, and among 15-24-year-olds, with 80% expressing interest. This suggests that the number of individuals, especially young people, working abroad may increase rapidly in the coming years. Notably, this potential increase aligns with a decline in the number of new labor force entrants into the domestic market.

Analyzing international labor flow and migration data indicates that labor outflow from Mongolia is not expected to decrease in the near future. It is projected that the outflow may start to diminish when Mongolia's GDP per capita increases by 2.6 times from its current rate. Essentially, when Mongolia's development level reaches that of countries like Poland, Turkey, and Hungary, a reduction in the outflow of citizens is anticipated. Empirical analysis using ILO data suggests that reducing outflows entails not only increasing GDP per capita but also maintaining a high employment rate and minimizing fluctuations in employment. Additionally, addressing air pollution and environmental degradation is crucial to reducing the outflow of the labor force.

10. There is an unmet demand for Elementary occupations.

Between 2017 and 2022, an average of 22.6 thousand jobs per year, totaling 134.3 thousand jobs over this six-year period, remained unfilled. The job order fulfillment rate of the General Agency for Labor Welfare Services declined from 73.0% in 2017 to 58.5% in 2022. Throughout this period, there were consistently 20.3-24.2 thousand unfulfilled job orders in Elementary occupations (M9), Craft and related trades workers (M7), Services and sales workers (M5), and Professionals (M2), accounting for 15.1%-18.1% of the total unmet demand.

Over the last eight years, the highest labor shortages have been observed in wholesale and retail trade, manufacturing, construction, and other services sectors.

11. Young people underestimate the opportunities provided by vocational education.

Disseminating essential information to optimize the career and educational choices of young individuals, both those currently in the workforce and those entering it, should be a priority for policymakers. To achieve this, it is crucial to enhance the Graduate Employment Survey conducted by the Training, Assessment and Research Institute of Labor and Social Protection

(TARILSP), making it more comprehensive and continuous, and to actively promote the survey results.

Based on data from graduates in the academic year of 2015-2016, several key insights were identified. During this period, bachelor's degree holders typically completed their studies in 4.1 years, whereas vocational school graduates completed their programs in almost 2 years less, averaging 2.3 years. Despite this shorter duration, 43.4% of vocational school graduates earn wages equal to or higher than the average wage of university graduates.

When considering factors such as the difference in tuition fees over 2 years, the variance in labor income during this time, and the practical experience gained in the labor market, vocational school emerges as a relatively optimal choice for many young individuals.

12. Multilateral efforts are essential for addressing complex challenges effectively.

In a period marked by a shrinking supply of new labor due to demographic dynamics, historical births, and labor force outflows, multilateral efforts become indispensable.

Primarily, there is a pressing need to direct budgetary and monetary policies, as well as active labor market policies, towards supporting the employment rate and fostering the creation of productive jobs.

Secondly, businesses and employers must exert greater efforts than ever before in recruiting, training, and retaining their young labor force.

Conclusions on labor demand or GDP forecasts

1. Accelerating and sustaining economic growth is imperative.

1.1. Comparing the objectives outlined in "Vision-2050" with the actual performance of recent years reveals a significant discrepancy. The economic growth slowed due to the impact of the Covid-19 pandemic, with a contraction of 4.6% in 2020, followed by a modest increase of 1.6% in 2021 and a more substantial growth of 5% in 2022. However, the failure to achieve the targeted 6% growth in these years has resulted in a cumulative difference of approximately 17.5 trillion MNT at 2015 comparable prices for the period 2020-2023. To align with the 2030 goal, it is imperative to bolster economic growth efforts and avoid any reduction, aiming for a growth rate of at least 7%.

1.2. When assessed using the Cobb-Douglas production function, the average economic growth rate from 2000 to 2022 stands at 6.93%. This period coincides with the commencement of operations at the Oyutolgoi open-pit mine, accompanied by extensive infrastructure development, road construction, and new building projects. Additionally, during these years, productivity growth remained relatively stagnant, indicating that our economy primarily expanded due to scale rather than productivity enhancements. To attain a 7% growth rate in the forthcoming years, it is imperative to prioritize productivity growth. This necessitates the implementation of radical technological reforms and the development of value-added production. It's crucial to recognize that the growth of the labor force is anticipated to decelerate compared to the previous 20-year period. Furthermore, there are no significant capital-intensive production projects expected, nor is there an anticipation of a substantial influx of foreign direct investment. Therefore, focusing on productivity-enhancing measures becomes even more critical for achieving sustained economic growth.

1.3. In terms of factors, approximately 51% of the total income should be allocated to labor, with the remaining percentage allocated to capital, to achieve distribution efficiency. Hence, there is a pressing need to increase wages.

1.4. In our study aimed at reducing the population density of the capital city and fostering stable settlement conditions in local areas, we examined the relationship between GDP growth and migration patterns across provinces. Using an exponential model, we estimated the percentage of the highest potential growth for several provinces. Specifically, Gobisumber, Dornogobii, Dornod, and Orkhon provinces, along with Ulaanbaatar city, exhibit growth rates that tend to surpass the target of 6%. Conversely, Arkhangai, Bayan-Ulgii, Bayankhongor, Bulgan, Darkhan-Uul, Dundgobi, Zavkhan, Uvurkhangai, Selenge, Uvs, Sukhbaatar, Tuv, Khuvsgul, Khovd, and Gobi-Altai provinces are characterized as slow-growing, with their highest annual growth rates falling below 6%. Migration statistics indicate a trend of higher migration rates in provinces with high growth, while provinces with slower growth experience more outbound migration.

1.5. Ensuring stable GDP growth of provinces above 6% is crucial for maintaining relatively stable migration patterns across regions. Presently, provinces situated along railways or those with intensified mining production are better positioned to meet these conditions. Therefore, it is imperative to enhance infrastructure and ramp up production activities in these provinces further. However, investing significantly in many provinces simultaneously may not be feasible due to limited opportunities. Hence, it is advisable to prioritize regional development initiatives to address this challenge effectively.

1.6. According to the investment calculations needed to sustain economic growth, it is imperative to make a total investment in 2024 equivalent to the investment made in Oyutolgoi in 2011. In comparison to 2018, where investment amounted to about 30% of GDP and economic growth hovered around 7%, the growth target estimated by the mixed trend model is anticipated to be achieved if Foreign Direct Investment (FDI) reaches at least 2.5 billion USD. To meet the 2035 target, it is likely that this amount needs to be increased by 5-7%.

2. The structure of the GDP sector plays a crucial role in boosting employment.

2.1. Mining and quarrying are poised to be the driving forces behind Mongolia's economic growth until 2030. This industry is projected to experience steady growth, contributing to 32.7% of Mongolia's GDP. However, its growth rate is expected to slow compared to other sectors, resulting in a slight decrease in its share to 29.4% by 2035. Conversely, the manufacturing industry is anticipated to witness a steady increase in its contribution to GDP, rising from 8.0% to 17.7% by 2022. This growth will be fueled by the processing of raw materials from the primary economic sectors, such as agriculture and mining, into final products. Additionally, the production of electricity, transportation, trade, and services will further bolster the manufacturing sector. As a result, the value added by the electricity and heat industry, currently accounting for 1.6% of Mongolia's GDP in 2022, is projected to surge 5.6 times to 2.3% by 2035. Similarly, the real GDP of the water supply and waste sector is expected to grow by 7.8 times.

2.2. The key lesson for policymakers derived from these forecasts is the importance of developing other industries that supply inputs to the manufacturing sector in a balanced manner. To increase the real GDP of the manufacturing industry from 2.3 trillion to 10.2 trillion MNT (at 2015 comparable prices) by 4.4 times, efficient utilization of the results from interdisciplinary balance analysis is essential. This approach enables policymakers to identify and address bottlenecks and inefficiencies across various sectors, facilitating a more balanced and sustainable growth trajectory for the manufacturing industry.

2.3. When comparing the economic structures of the world's developed countries, a notable trend emerges: less developed countries tend to have a higher share of primary sectors

(agriculture, mining, quarry) in their GDP, while the share of manufacturing and service industries is relatively small. However, as economies develop, there is a discernible shift in this structure. The share of primary industries decreases, while the share of manufacturing sectors increases. In contrast, developed countries exhibit a different economic structure. Here, the percentage of the primary industry is low, and the percentage of the manufacturing industry, while present, is also relatively low. However, the service industry's share is notably high in developed economies. This transition reflects the evolution from agrarian and resource-based economies towards more diverse and service-oriented economies as countries progress and industrialize.

2.4. As of 2022, Mongolia's GDP is heavily reliant on two sectors, with agriculture and mining and quarrying accounting for 40.4% of the total GDP. The industrial sector, inclusive of the construction industry, contributes 13.8% to the GDP, while the remaining portion, accounting for 45.9%, is attributed to other or service industries. Looking ahead to 2035, there is an anticipated shift in the composition of Mongolia's GDP. The share of agriculture, mining, and quarrying industries is projected to decrease slightly to 38.2%, while the manufacturing industry is expected to increase significantly to 24.0%. Concurrently, the service industry's share is forecasted to expand to 37.8% of the GDP. This transition underscores the country's evolving economic landscape, with a gradual diversification away from heavy dependence on primary sectors towards a more balanced mix of manufacturing and service industries.

2.5. Until 2035, Mongolia is projected to undergo a gradual transition from an economy heavily reliant on agriculture and mining towards a production-oriented economy. Consequently, it is imperative to implement a human resource policy geared towards supporting the production industry during this transition period. However, it's essential to recognize that primary and production industries are capital-intensive compared to service industries. Therefore, while supporting the production industry is crucial, equal attention should be given to bolstering the service industry, which requires relatively less capital investment. This includes preparing and training human resources to meet the demands of the service sector. Given Mongolia's unique geographical features, there is potential to develop borderless services and tourism-related services. Leveraging these opportunities can contribute significantly to the growth and diversification of the service industry, thereby facilitating the overall economic transformation of Mongolia.

2.6. The input-output table allows for the analysis of the production multiplier of an industry, which provides insights into the extent to which other industries are involved and their respective contributions. This analysis helps identify which industries should be developed in conjunction with the target industry, thereby highlighting sectors that create labor demand. This concept is further elucidated through the analysis of the labor multiplier. For instance, in 2019, 0.8762 jobs were created for every worker in the mining and quarry industry. This figure increases to 1.3422 jobs in 2025, 2.1482 jobs in 2030, and 2.9044 jobs in 2035. In 2035 specifically, the industry that would generate the most jobs per worker is the Electricity and Heating industry, with a labor multiplier of 3.7623. Following closely behind is the mining industry, with a multiplier of 2.9044, and the manufacturing industry, with a multiplier of 2.4724. Utilizing the labor multiplier enables policymakers to identify industries that have the potential to create the most jobs, thereby informing strategic decision-making and resource allocation to promote employment growth and economic development.

Conclusions on forecasts regarding the population, labor force, foreign migration and graduates

1. Based on population projections, Mongolia's population is expected to reach 4.1 million by 2035, reflecting a 23% increase compared to 2020. The average annual net growth rate is forecasted at 1.4%.
2. Estimates indicate that by 2035, the working-age population in Mongolia will reach 2,647.1 thousand, constituting 64.7% of the total population. This represents a slight increase from the 64.1% reported in the 2020 Population and Housing Census. The working-age population is projected to peak in 2033 at 64.9%, with a subsequent gradual decline anticipated thereafter.
3. With the rising life expectancy in Mongolia, the burden of an aging population is expected to grow, while the burden of the young population may decrease due to declining birth rates. Hence, short- and medium-term policies should address this demographic shift to leverage the period of declining dependency ration effectively.
4. In 2020, the number of individuals entering the working-age population and those exiting the working age totaled 16,058. By 2035, this figure is projected to rise to 32,546. The number of new individuals entering the working-age population is expected to peak in 2030, reaching 2.1% of the total population.
5. Estimates indicate that by 2035, the population eligible for pension benefits will increase by 1.8 times compared to 2020, reaching 405,000 individuals.
6. Population estimations by provinces show that Ulaanbaatar is the main center of economic and population development, and the population growth rate is still the highest.
7. By 2035, it's estimated that a total of 620,998 students will graduate from general schools, with 33,045 expected to graduate in 2024, increasing to 63,970 by 2035. This signifies a 1.9-fold increase in graduates compared to 2024. Consequently, without substantial real economic growth, there's a risk that labor absorption may not keep pace.
8. The number of university and TVET graduates is projected to increase by 1.8-1.9 times in 2035 compared to 2024, indicating an acceleration in student growth from previous levels.
9. Historically, Mongolia's economy doubled in nominal terms every five years since 2008, yet labor force growth has been slow due to low real GDP growth. Increased real GDP would necessitate a corresponding increase in the labor force, necessitating alignment with the number of graduates.
10. The most active participants in migration are citizens aged 25-34, signifying a departure of young individuals with professional experience and high labor productivity from Mongolia's labor market.
11. Without measures to reduce foreign migration and encourage return migration, foreign migration is projected to reach 206.6 thousand by 2035, a 68.9% increase from 2020. The majority of migrants are likely to be educated individuals, leading to a potential loss of highly productive labor.
12. Due to insufficient data, forecasting the number of foreign workers in Mongolia is currently not feasible.
13. Future policies should focus on attracting foreigners with high technical and technological skills, aligning with development policy objectives and labor migration laws.
14. Labor market supply and demand forecasting necessitates integrating projections of economic conditions, industry growth and change, labor force supply and demand, population dynamics, and foreign migration to estimate potential differences and the need for foreign labor.
15. Quantitatively, no labor market shortage is expected in 2035, though it's anticipated to emerge by 2050. Demographic projections indicate an increase in the working-age

population and a decrease in demographic load. In 2035, 1.8-1.9 labor force growth is required to meet GDP growth targets.

16. Given that the young people of the new millennium will constitute a significant portion of the future labor force, comprehensive reforms in human resource policies are imperative. By 2035, approximately 1.3 million of the 3 million working-age population will belong to the "new millennium" generation.
17. The number of school seniors is expected to rapidly increase from 44,000 to 79,000 since 2026, leading to a rise in university and college graduates. Access to schools must be expanded to accommodate this growth, with the number of graduates projected to increase steadily in the coming years.

Conclusion on industry-occupation structure

1. The trend in the structure of workers in agriculture and transportation and warehousing indicates a consistent decrease each year. Specifically, the share of workers in the agricultural industry is projected to decline by 16.6% (8.4 percentage points) by 2035, likely influenced by factors such as climate changes and underdeveloped local areas. Conversely, industries such as construction, finance and insurance, and administrative and support activities are experiencing notable growth.
2. To bolster the total number of workers and create new jobs, investment in agriculture—known for its high labor multiplier and job creation potential—is crucial. Implementing policies to revitalize local areas, increase the processing and export of agricultural products, and provide financial and tax incentives can address various challenges, including decentralization, urban-rural development balance, income inequality, and poverty.
3. Occupationally, Skilled workers in agricultural, forestry, and fishery workers (M6) are anticipated to decrease the most (by 7.9 percentage points) by 2035, while occupations such as Professionals (M2), Clerical support workers (M4), and Services and sales workers (M5) are expected to increase. These shifts are driven by changes in demand, skills, and productivity within economic activities.
4. Optimizing the occupational structure entails prioritizing professions that require high professional skills, such as professionals, technicians, engineers, doctors, and teachers, over managerial roles. Additionally, given the ongoing digital transition, there is a need to gradually limit the supply of certain professions at risk of automation, while incentivizing students to pursue priority professions through educational support programs and scholarships.
5. Addressing the lack of comprehensive labor market data requires regular studies on employment trends, migration patterns, and skill demands. Integrating platforms like E-Mongolia, Sudalgaa.gov.mn, and Ejob.gov.mn with enhanced functionalities can facilitate better data collection and analysis.
6. Seasonal unemployment poses a significant challenge in industries like mining, construction, agriculture, and tourism. Flexible staffing solutions, including multi-field specialized training in TVETs, can help mitigate these challenges.
7. Bridging the gap between educational institutions and employers is essential to address the mismatch between skills and job requirements. Universities and TVETs should focus on aligning their curricula with industry needs to better prepare graduates for the labor market.

Further considerations related to labor market research methodology

1. Broadening Scope to Include Flow Variables: Presently, labor market surveys in Mongolia predominantly emphasize stock variables, influenced by available data and specific policy goals. However, incorporating flow variables, such as migration patterns, in future studies can offer a more dynamic understanding of Mongolia's labor market. This trend aligns with a

growing emphasis on flow variables in labor economic research globally, with organizations like the ILO also recognizing their significance.

2. Micro-level Analysis of Wages and Working Hours: A crucial aspect of understanding employment dynamics is examining differences in wage rates and working hours among individuals or groups. Thus, prioritizing empirical research on worker wages and working hours using micro data from labor force studies can enhance our comprehension of Mongolia's labor market.
3. Balancing Forecasting with Current Analysis: While forecasting plays a pivotal role in policymaking, a thorough examination of the current state of the labor market is equally essential. Detailed analyses of present conditions can provide broader insights into the accuracy and reliability of forecasts, enabling policymakers to discern stable variables from those prone to volatility. This nuanced understanding facilitates more effective policymaking.
4. Intermediate Forecasting and Confidence Intervals: Intermediate forecasting methods offer advantages over point estimates, enhancing the value of labor market studies. Including 95% confidence intervals for key variables in forecasting models bolsters the credibility and utility of projections. By providing stakeholders with a clearer understanding of potential outcomes, confidence intervals contribute to more informed decision-making processes.

CHAPTER 8

RECOMMENDATIONS ON FURTHER IMPLEMENTATIONS

8. RECOMMENDATIONS ON FURTHER IMPLEMENTATIONS

Creating a policy system to support employment

1. Amend the Law on the Central Bank (Bank of Mongolia) **to incorporate the objective of supporting sustainable employment as one of the primary goals of the government's monetary policy. This amendment should be accompanied by mechanisms to monitor and ensure the effective implementation of this goal.**
2. **Establish a Labor Market Policy Council, either under the Government or the Parliament,** tasked with formulating and advising on regulations related to macroeconomic, monetary, and fund policies, as well as labor market policies and regulations. The Council, comprising representatives from entities such as the Bank of Mongolia, the National Statistical Office, relevant ministries (such as Economy and Development, Finance, Labor and Social Protection), the Mongolian National Chamber of Commerce and Industry (MNCCI), Employers' Association, and experts, will analyze labor market policies, review implementation reports, and provide recommendations to relevant stakeholders, including the Parliament and the Government.
3. **Set up a dedicated office under the auspices of the Policy Council** to conduct comprehensive research and analysis of labor market policies. This office will be responsible for developing short-, medium-, and long-term forecasts of the labor market, making policy recommendations based on these forecasts, and providing relevant information and research findings to both the Policy Council and the Government.
4. Utilize the provisions outlined in Article 51.3/51 of the Law on Legislation to **initiate an evaluation of the impact of enforcing the Law on Employment Support (2011)**. Following this evaluation, consider amendments to the law aimed at broadening the scope of employment support activities and enhancing enforcement mechanisms. This step is crucial for improving the effectiveness and outcomes of state policies related to employment support.
5. **Conduct a comprehensive evaluation of the enforcement of the State actions aimed at supporting labor market demand**, as stipulated in Article 5.1/5 of the Law on Employment Support. Following this evaluation, **implement necessary measures to strengthen enforcement, ensuring that the intended objectives of these actions are effectively met.**
    - Initiate research initiatives to explore opportunities for exporting national products to foreign markets, facilitating agreements and negotiations to enhance market access.
    - Provide financial support in the form of loans to small and medium-sized enterprises engaged in export-oriented production, thereby stimulating job creation. Additionally, consider offering tax incentives contingent upon the number of jobs generated through these initiatives.
    - Facilitate private sector investments in remote and economically disadvantaged regions, either independently or through public-private partnerships, to spur economic growth and employment opportunities in these areas.
    - Implement additional measures as determined by the Government to further bolster labor market demand and promote sustainable economic development.
6. **Broaden the mandate of the Ministry of Labor and Social Protection (MLSP) in the following ways:**

- Increase the allocation of funds for employment support initiatives within the budget package of the Ministry of Labor and Social Protection to enhance the effectiveness of such programs.
- Equip line ministries, provincial governors, and city authorities with comprehensive policies and methodologies for devising, executing, overseeing, and assessing employment strategies tailored to their respective industrial sectors and geographical regions.
- Facilitate the integration of employment policies across various industries, provinces, and capital cities, offering centralized oversight, management, and coordination to streamline efforts and maximize impact.

7. Incorporate provisions within the budget law and other pertinent legislation **mandating the assessment of human resource needs when formulating state and local budget investment proposals for programs, projects, and initiatives.**
8. Integrate provisions into relevant laws and regulations **requiring the consideration of the number of permanent jobs to be generated when prioritizing programs, projects, and measures** for implementation using state and local budget investments.
9. Establish a regulation **mandating the evaluation of the number and quality of new jobs created during the reporting period when assessing the performance of ministries and provincial and city governors.**
10. **Submit a bill to Parliament seeking approval for the legal status of the Council of Professional Associations.** The Ministry of Labor and Social Protection (MLSP) should collaborate with professional associations to formulate and advocate for industry-specific human resources policies, as well as provide essential professional methodologies.

Develop skills necessary for the labor market or ensure coordination between the education sector and the labor market

1. **Incorporate a course on preparing for the labor market into the 8th and 9th-grade curriculum of general education schools.** This program should:
   - Offer guidance on the technological and digital skills essential for contemporary employment.
   - Facilitate career exploration through internships, workplace visits, observation, and mentorship, guiding students in planning their future careers.
   - Foster soft skills like problem-solving, critical thinking, communication, teamwork, and adaptability.
   - Deliver foundational knowledge in financial literacy, entrepreneurship, and related areas.
2. **Introduce a course covering fundamental aspects of labor relations and legislation into the curriculum of vocational training institutions.**
3. **Revise requirements and criteria for accrediting higher education and vocational training institutions as necessary.**
   - Conduct labor market demand research for each training program.
   - Gather feedback and insights from graduates and employers regarding the requisite skills, incorporating them into the program.
   - Enlist seasoned industry professionals to instruct certain segments of the professional courses.
4. **Limit scholarships and loans from the Education Loan Fund to university students majoring in non-priority fields such as business management and social sciences,**

while allocating more to Science, Technology, Engineering, and Mathematics (STEM) majors.

5. **Establish a flexible system within vocational training institutions to offer short-term training and retraining programs for skilled personnel based on employer demand in the labor market.**
   - Implement a performance-result-based financing system within vocational training institutions.
   - Directly assess the competencies of individuals who have acquired specific skills and issue competency and professional certificates accordingly.
   - Provide training specifically for deficient competencies, assess these competencies, and issue professional certificates upon completion.
   - Offer on-the-job qualification and refresher trainings based on employer requests.
6. **Revise the requirement for studying abroad with loans and scholarships from the Education Loan Fund to encompass** not only attendance at top universities but also **institutions in countries internationally renowned for their advancements in specific professional and technological domains, where techniques and technologies from these countries are predominantly utilized in Mongolia.** For instance, focus on cultivating expertise in fields such as production technology, automation, and equipment assembly through programs in China, South Korea, and Japan.
7. **Integrate the notion of continuous skill development in lifelong training programs, career guidance, and information dissemination activities, acknowledging the dynamic nature of the labor market.**
8. **Collaborate with professional associations and major employers to establish a career path program under the auspices of the Ministry of Labor and Social Protection (MLSP):**
   - Develop and maintain a methodology for assessing professional skills and mapping competencies, regularly updating it to align with industry development trends.
   - Establish career guidance, recruitment, and occupational advisory services to assist individuals in navigating their career paths effectively.
   - Facilitate networking and mentoring initiatives connecting industry organizations, enterprises, experts, and peers to foster knowledge sharing and career advancement.
   - Encourage career promotion and development through certification programs and professional degrees, highlighting opportunities for skill enhancement and progression within respective fields.

To enhance the effectiveness of common employment services and support activities through capacity-building measures

1. Transform the employment support activities outlined in Article 6 of the Law on Employment Support, **encompassing common employment services, from a reactive approach—where services are provided in response to jobseekers and employers seeking assistance—to a proactive model that anticipates and responds to labor market demands:**
   - Anticipatory Approach: Proactively identifying and mitigating potential employment challenges before they escalate into crises.
   - Long-Term Planning: Investing in education, skill development, and fostering a conducive business environment to foster sustainable employment growth.

- Diversification and Innovation: Promoting economic diversification, fostering emerging industries, and encouraging innovation to foster a resilient job market.
- Continuous Improvement: Constantly monitoring labor market dynamics and adjusting policies and strategies in response to economic shifts and evolving needs.

2. **Enhance funding for employment promotion initiatives and broaden the funding base of the employment promotion fund.** Explore additional revenue streams, such as service fees from employers for services like human resource recruitment, mediation, database access, and information dissemination.
3. **Introduce a performance-based financing system** for funding employment organizations at the provincial, municipal, and district levels, as well as employment officers and labor offices at the township and subdistrict levels, private labor exchanges, and private enterprises offering common employment services.
4. **Expand the scope of private labor exchanges, training, and consultancy service providers** across various industries and occupations, ensuring improved operational effectiveness:
   - Facilitate mediation for part-time, temporary, and seasonal employment opportunities.
   - Establish and mediate brigades, teams, and groups specializing in specific services or focused on one-time projects.
   - Connect specialists with unique specialties and skills to relevant job opportunities.
5. **Incorporate considerations for seasonal industry employment effects into employment policy, planning, and service development through cross-sector collaboration:**
   - Facilitate resource sharing, such as deploying education sector personnel to the tourism industry during peak seasons and agricultural sector workers to the transport and storage sector during off-peak periods.
   - Foster skills transferability between industries to optimize workforce utilization.
   - Implement joint training programs to equip workers with versatile skills applicable across different sectors.
   - Encourage collaboration between sectors and professional associations to address labor force needs comprehensively.
   - Establish mechanisms for information exchange on labor force demand and ongoing projects to facilitate proactive workforce planning.
   - Promote intra-provincial activities and manage workforce requirements at the provincial and district levels through regional collaboration.
   - Establish and utilize part-time talent pools to address fluctuating labor demands effectively.
6. **Establish regulations for part-time work and temporary workplaces in accordance with the Labor Law, ensuring alignment with the needs of both employers and employees.** Introduce best practices from foreign franchise services like Arbeit and Samushil, refining regulations and raising awareness among all stakeholders.
7. **Allocate a portion of the Employment Support Fund to support startup companies developing human resource training, information, employment, and part-time employment applications.** This initiative aims to foster innovation and entrepreneurship in addressing employment challenges.
8. **Conduct research on construction "brigades" and other forms of informal teams or groups, making necessary adjustments to formalize their activities. Provide support to transition these entities into the formal sector, enhancing labor relations, social security, and working conditions.**

9. **Establish an employment ecosystem tailored to the care economy, addressing the unique needs and challenges of this sector:**
    - Develop policies and regulations facilitating the introduction of private sector-based care services, including professional care, paid services, and supplementary support, while establishing quality standards and service guidelines.
    - Establish infrastructure to support private sector-based care services, such as standardized and accredited training centers for caregivers, databases of qualified personnel, customer-facing platforms, and certification and mediation services.
    - Promote awareness among private sector employers about the opportunity to provide care services, offering financial and logistical support to address employee well-being and social issues.
10. **Develop a framework for the involvement of local citizens in state-funded infrastructure projects.** This can be achieved through the following steps:
    - Compile a list of projects, buildings, and facilities slated for implementation in the targeted province, soum, or district, drawn from the roster of investment initiatives earmarked for state budget allocation. This list should be submitted to the employment officer (labor agency) of the respective soum or khoroo.
    - The employment officer (labor agency) of the soum or khoroo should conduct a survey to identify qualified workers and residents interested in participating in the designated project or construction.
    - Following the release of tender selection results and notification of contract signing by the designated contractor, submit a survey detailing potential local candidates to the executing entity.
    - If deemed necessary, facilitate preliminary training sessions for local individuals identified for potential involvement in the project.

Implementing policies and measures to enhance productivity across all levels

1. Examine the "Decent Work and Productivity" policy document released by the ILO, along with the concepts and operational framework of Productivity Ecosystems for Decent Work, as well as the projects and research conducted within this initiative. **Develop and execute a policy program aimed at establishing a productive ecosystem to foster the creation of quality employment opportunities in Mongolia.**

At macro and meso level

2. **Foster social dialogue to enhance productivity and facilitate the creation of quality employment opportunities.** Facilitate discussions among governments, employers, and workers at various levels, including bilateral, tripartite, national, sectoral, and enterprise levels. Encourage stakeholders to collaborate on defining shared interests, establishing working environment principles, and jointly addressing challenges and developing policies through consensus.
3. **Develop a Human Resource Compliance model and conduct outreach efforts to educate employers.** Create models, manuals, training materials, and training sessions based on best practices from international organizations and civil society initiatives. Disseminate information to employers to ensure compliance with human resource standards.
4. **Establish a system to monitor and report on employers' compliance with human resource standards, utilizing civil society organizations.** Publicize the findings to increase employers' motivation to enhance working conditions and encourage citizens and

workers to prioritize law-abiding employers. Incorporate compliance reporting into companies' corporate social responsibility and sustainability reports.

5. **Educate employers and human resource managers on the principles and regulations outlined in Mongolia's Labor Law (revised) related to creating quality work environments.** Launch campaigns emphasizing that adherence to these principles not only fulfills legal obligations but also aligns with international human resource development trends, positioning employers as desirable workplaces.
6. **Provide policy recommendations for aligning wages with labor productivity, economic conditions, business performance, and market dynamics.** Disseminate these recommendations to the public, employers, and employees. Learn from global best practices, such as the National Wage Council of Singapore, to inform policy development.
7. **Initiate and implement a "Productivity Revolution" under government auspices to enhance productivity across all sectors.** Adopt and adapt successful strategies from other nations to drive productivity improvements domestically. For instance:
   - Singapore's Productivity and Innovation Credit (PIC) Scheme[3],
   - Japan's productivity improvement initiatives (Kaizen Model of Continuous Improvement, New Economic Recovery Plan or New Capitalism Policy),
   - German Industry 4.0 initiative (Industrie 4.0),
   - Initiatives to establish Australian Industrial Growth centers[4],
   - Initiatives of developed countries such as the Innovation 3.0 initiative of South Korea's processing industry, and
   - Good practices of developing countries such as India, China, Brazil, Kenya, Vietnam and Mexico.
8. **Establish a centralized state administrative body overseeing industry and trade affairs** to facilitate support initiatives, such as linking supply chains, production clusters, and suppliers with buyers. Coordinate state efforts to bolster labor market demand as outlined in Article 5, Clause 5.1 of the Law on Employment Support, based on input from private sector entities, industries, and professional associations.
9. **Encourage increased investment in research and development (R&D) to foster innovation, technological advancement, and market exploration.** Provide tax incentives, such as tax relief, for enterprises engaged in activities such as Technical Experiments (ISIC 7120), Natural Science Research and Experiments (ISIC 7210), and Market and Sociological Research (ISIC 7320), along with their products and services.
10. **Support training and R&D endeavors aimed at enhancing the human capital of employers and enterprises.** Offer VAT and Entity income tax exemptions for costs incurred by enterprises establishing and operating training centers for employee development or collaborating with universities and vocational education institutions. Encourage investments in research and development to be tax-exempt.
11. **Embrace the concept and ethos of occupational specialization in collaboration with professional associations.** Foster a culture that values and promotes specialized skills and expertise within various industries and sectors. Encourage partnerships between professional associations and relevant stakeholders to advance occupational specialization initiatives.

At micro level

[3] https://www.iras.gov.sg/taxes/corporate-income-tax/specific-topics/productivity-innovation-credit-(pic)-scheme
[4] https://www.arc.gov.au/industry-growth-centres-initiative

12. **Foster a paradigm shift among employers, emphasizing their responsibility to equip employees with essential skills and to invest in their training and development.** Mandate that enterprises with over 100 employees establish and operate training centers for employee development or collaborate with universities and vocational education institutions to ensure skill enhancement.
13. **Implement management methodologies aimed at enhancing productivity,** including process optimization, performance assessment, employee training and development, fostering innovation and creativity, and promoting continuous improvement practices.
14. **Design and execute comprehensive Employee Well-Being Programs alongside Diversity, Equity, Inclusion, and Belonging (DEIB) initiatives within workplace cultures.** Prioritize initiatives that cultivate a supportive environment, promote employee welfare, and foster diversity, equity, and inclusivity within the organizational framework.

Enhancing labor market research, information, and dissemination for policymakers and citizens

1. **Integrate employment services into the e-mongolia digital platform for public services, enabling comprehensive access to citizens' education, professions, and employment status for labor market research and planning.** Include school and social insurance data in the "My Information in the Government" section, offering reference services on education, professions, organizational affiliations, job roles, and work history. Foster linkage between employment and welfare services.
2. Establish connectivity between ejob.gov.mn and the integrated labor market information system within the e-mongolia digital platform, **facilitating citizen access to labor market insights and job opportunities.**
3. **Enhance the accuracy and oversight of employment service records,** implementing recommendations from the National Audit Office's 2022 performance audit on employment promotion policies. Address deficiencies in the unified control system to ensure effectiveness in measuring, evaluating, and implementing employment policies.
4. Collaborate with professional associations and major employers **to compile a sector-specific list of occupations, labor demands, requisite skills, work environments, and salary projections, disseminating this information to the public.**

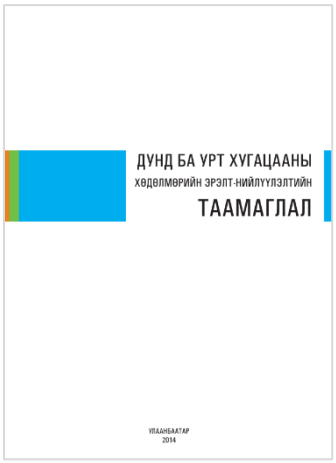
CHAPTER 9
METHODS AND METHODOLOGIES

9. METHODS AND METHODOLOGIES

The following tasks were undertaken as part of developing the methodology for forecasting mid-term demand and supply in the internationally recognized labor market:

1. Assess the past outcomes and methodologies used for short- and mid-term labor supply and demand forecasting in Mongolia. Compare these with the actual results and extract lessons to inform future labor market forecasts.
2. Review international methods and experiences regarding forecasting labor demand and supply. Draw methodological conclusions based on this analysis.
3. Select suitable methods and models tailored to the data and statistics available in Mongolia.

9.1. Conclusions made to the results of previous forecasting and methodologies in Mongolia



Forecasts on mid- and long-term labor demand-supply (LRI, 2014): In 2013, the Labor Research Institute (now TARILSP), in collaboration with researchers from the Republic of Korea, devised the "Mid and Long-Term Forecasting Model of Demand and Supply of the Mongolian Labor Market." This model aimed to generate long-term projections for the labor market and analyze the interplay of factors influencing it, all to provide essential insights for crafting employment policies in Mongolia. The outcomes of the forecasting model for 2014 are detailed below.

Methodology used for forecasting: Mid and long-term forecasting model:

- Labor supply forecasting (labor force forecasting)
- Labor demand forecasting (employment forecasting).

The following indicators were calculated and used to make **the forecast of labor supply based on population projections**:

1. **Working age (15 and older) population:** Population projections are derived from the findings of the 2010 Population and Housing Census carried out by the National Statistics Office (NSO). Specifically, the version employing an average decrease in fertility (2B) is utilized for forecasting the settled population of Mongolia.
2. **Labor force participation rate (LFPR):** The labor force participation rate (LFPR) was projected by gender and age groups, drawing from LFPR statistics spanning from 2006 to 2013 as provided by the NSO's Labor Force Survey (LFS).
3. **Labor force:** The forecasted working-age population and the LFPR were utilized to calculate the labor force, representing the total labor supply.

When forecasting the employment based on the forecasts of economic growth[5]:

1. Employment and total employment within each industry were determined by employing the GDP forecast alongside the labor consumption coefficient, which was forecasted by economic activity sector.

[5] The forecast of economic growth was directly taken from the forecast of Mongolia's GDP by the IMF.

2. Employment within each industry was further delineated by occupation, utilizing the assumptions outlined in the "Industry-Occupation" matrix.
3. The total unemployment rate and employment rate were computed using the outcomes of the labor supply forecast and employment forecast.

Comparison of forecast results and actual performance: When comparing the 5-year (short-term) forecast or 2018 forecast with the actual results of that year, the **projected population aged 15-64 (working age) was lower than the actual performance by 181.5 thousand (8.6%)**. According to the revised projections (2B version) covering the period from 2010 to 2040, based on the NSO's 2010 Population and Housing Census results, the population aged 15-64 in 2018 was estimated to be 2112.4 thousand, which is 3.9 thousand higher than the actual count. The report mentions utilizing the most suitable version of quantitative data, specifically the projection for the period of average birth rate decrease estimated for the population of Mongolia, or data from version 2B of the population aged 15 and older for each age group up to 2023. It acknowledges the challenge of using population projections directly from the NSO's Population projections due to methodological differences, particularly in capturing key labor market indicators. However, the report lacks clarification on the methodology employed for the revision of the population forecast aged 15 and older until 2023.

Table 67: Comparison between population forecast and actual performance

Indicator		Estimates for 2018 (NSO, 2010, version 2B)	Forecast for 2018	2018 performance	Gap, forecast and performance (in numbers)	Gap, forecast and performance (in percent)	Gap, Population projectionand performance (in numbers)
Population, (thousand persons)	**15+**	2,330.1	2,043.0	2,236.4	-193.4	91.4%	-93.7
	15-64	2,112.4	1,927.0	2,108.5	-181.5	91.4%	-3.9
	15-29	751.5	689.0	767.9	-78.9	89.7%	16.4
	30-54	1,133.0	1,033.0	1,117.2	-84.2	92.5%	-15.7
	55+	445.6	324.0	351.3	-27.3	92.2%	-94.4
Popultation aged 15 and over (thousand persons)	**Male**	1,089.1	994.0	1,079.2	-85.2	92.1%	-10.0
	Female	1,151.0	1,050.0	1,157.2	-107.2	90.7%	6.2

In 2018, **the forecasted LFPR was 63.7%, whereas the actual performance stood at 61.0%**. By 2023, the forecasted LFPR dropped to 62%, contrasting with the actual rate of 58.6% in 2022. Initially, the LFPR was slightly overestimated, with the disparity widening over time. Notably, the LFPR forecast for the 15-19 age group was relatively high (8 points in 2018 and 8.7 points in 2023), while individuals over 65 exhibited a lower forecasted LFPR. Moreover, the higher forecasted LFPR among women corresponded to lower actual performance.

Table 68: Comparison between forecasted labor force participation rate and actual performance

Sex	Age group	Forecast for 2018	2018 performance	Forecast for 2023	2022 performance	Gap, (2018)	Gap, (2023 and 2022)
Total	**Total**	**63.7**	**61.0**	**62.0**	**58.6**	-2.7	-3.4
	15-19	18.6	10.6	18.0	9.3	-8.0	-8.7
	20-24	52.7	52.9	52.8	52.5	0.2	-0.3
	25-29	77.6	73.7	77.6	78.6	-3.9	1.0
	30-34	81.3	80.8	81.3	77.2	-0.5	-4.1
	35-39	85.0	83.1	85.0	79.3	-1.9	-5.7
	40-44	85.9	84.4	85.9	83.1	-1.5	-2.8
	45-49	83.8	84.4	84.2	82.6	0.6	-1.6
	50-54	71.5	73.0	71.7	75.0	1.5	3.3
	55-59	49.6	48.5	49.7	45.9	-1.1	-3.8
	60-64	25.7	21.1	25.5	26.5	-4.6	1.0
	65+	11.1	15.5	10.8	13.3		
	70+		7.7		4.7		
Male	**Бүгд**	**68.6**	**69.5**	**68.9**	**66.4**	0.9	-2.5
	15-19	23.2	15.8	22.7	12.1	-7.4	-10.6
	20-24	60.3	61.7	60.3	62.7	1.4	2.4
	25-29	85.6	87.1	85.5	86.9	1.5	1.4
	30-34	88.6	92.7	88.6	90.4	4.1	1.8
	35-39	89.4	91.5	89.4	90.0	2.1	0.6
	40-44	88.9	89.5	88.8	88.6	0.6	-0.2
	45-49	86.8	87.7	87.1	87.9	0.9	0.8
	50-54	78.7	79.5	79.0	76.8	0.8	-2.2
	55-59	63.2	65.0	63.0	62.2	1.8	-0.8
	60-64	32.0	26.0	31.5	29.4	-6.0	-2.1
	65-69	15.8	18.6	15.8	18.4		
	70+		11.4		6.3		
Female	**Total**	**56.4**	**53.4**	**56.2**	**51.5**	-3.0	-4.7
	15-19	13.9	5.3	13.3	6.2	-8.6	-7.1
	20-24	45.0	44.0	45.0	43.3	-1.0	-1.7
	25-29	69.6	61.5	69.6	70.2	-8.1	0.6
	30-34	73.9	69.5	74.0	65.3	-4.4	-8.7
	35-39	80.6	75.5	80.6	69.4	-5.1	-11.2
	40-44	83.1	79.8	83.1	77.8	-3.3	-5.3
	45-49	81.1	81.4	81.4	77.7	0.3	-3.7
	50-54	65.1	67.4	65.1	73.5	2.3	8.4
	55-59	37.9	34.3	38.2	32.9	-3.6	-5.3
	60-64	20.8	17.7	20.7	24.4	-3.1	3.7
	65-69	8.1	13.3	7.7	9.2		
	70+		5.2		3.6		

Despite the relatively optimistic forecast for economic activity among young people aged 15-29, the actual performance lagged behind by 5.1 percentage points in 2018 and 3.5 percentage points in 2022 compared to the predicted results for 2023. In terms of unemployment rate, the forecast predicted 6.0% in 2018, whereas the actual rate was 7.8%; for 2023, the forecast was 5.0%, yet the actual rate in 2022 was 6.7%.

Regarding overall employment forecasts for the economy, in 2018, it was underestimated by 29.4 thousand people. In 2023, the forecast predicted 1,317.2 thousand employed individuals, which was 136.7 thousand more than the performance in 2022. However, in reality, employment in 2023 was lower, likely due to the lingering effects of COVID-19 between 2020 and 2022.

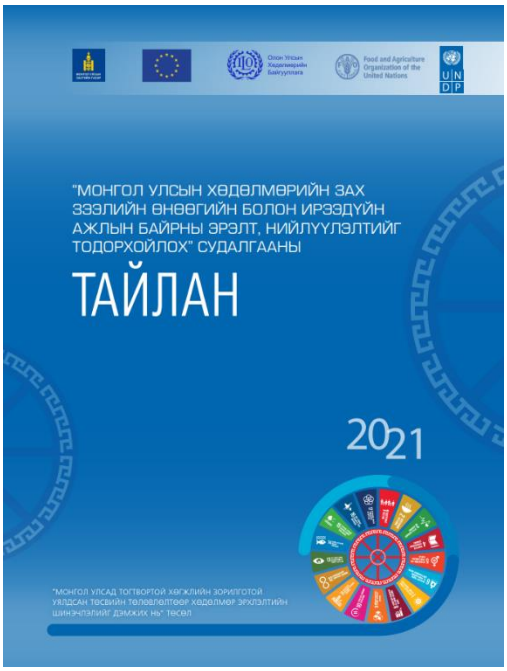
In terms of economic sectors, although employment in agriculture, forestry, fishing, and hunting was forecasted to decrease, the actual performance exceeded expectations by 80.7 thousand in 2018 and by 81.0 thousand in 2022. Conversely, employment in mining and quarrying, construction, transportation, and warehousing industries was expected to increase, but the actual performance fell short by 8.3, 16.2, and 11.4 thousand, respectively, compared to 2018.

Table 69: Comparison between *f*orecasted employment and actual performance

Classifications of economic activities	2018*	2018	2023*	2022
Agriculture, forestry, fishing and hunting	253,382	334,101	212,984	293,974
Mining and quarrying	66,051	57,687	83,147	60,342
Manufacturing	98,397	100,805	123,857	112,665
Electricity, gas, steam, air conditioning supply	14,926	16,307	18,698	22,040
Water supply; sewerage, waste management and remediation activities	8,819	6,869	10,062	6,835
Construction	92,793	76,596	98,269	77,527
Wholesale and retail trade; repair of motor vehicles and motorcycles	197,001	211,187	199,544	146,236
Transportation and storage	84,971	73,567	103,745	68,175
Accommodation and food service activities	39,471	37,484	46,725	32,019
Information and communication	22,581	14,089	27,366	19,155
Financial and insurance activities	26,209	25,689	31,409	22,570
Real estate activities	1,612	770	2,252	2,472
Professional, scientific and technical activities	21,497	14,608	34,046	15,132
Administrative and support service activities	22,174	18,185	23,986	13,930
Public administration and defence; compulsory social insurance	72,416	76,197	79,734	82,129
Education services	104,198	98,738	109,795	104,397
Human health and social work activities	51,855	49,462	60,259	49,659
Arts, entertainment and recreation	12,906	13,835	11,398	14,114
Other service activities	32,331	23,364	39,936	34,180
Activities of households as employers of domestic	-	1,226	-	951

Activities of extraterritorial organizations and bodies	-	2,256	-	1,974
Total	**1,223,588**	**1,253,023**	**1,317,212**	**1,180,474**

Survey report to determine current and future job demand and supply in Mongolia's labor market (Government of Mongolia, EU, ILO, FAO, UNDP, 2021):



In 2021, the "Environment and Agricultural Economics Institute of Mongolia" Community NGO conducted the "Survey to Determine Current and Future Job Demand and Supply in the Labor Market" with the support of the European Union (EU)-funded project "Supporting Employment Reforms in Mongolia through Fiscal Planning Coordinated with Sustainable Development Goals," implemented by the United Nations Development Program (UNDP). Forecasts for 2025 and 2030 were made based on data from 2010-2019.

Methodology used for forecasting:

Forecasting the future demand and supply of Mongolia's labor market for the period up to 2030 was conducted following the methodology used in the "Mid-term and Long-term Forecast of Demand and Supply of Mongolia's Labor Market" research conducted by LRI in 2014.

Comparison of forecast results and actual performance: The forecast is based on pre-Covid figures, meaning it does not reflect the impact of Covid. Additionally, the forecasts for 2025 and 2030 have not been compared with actual performance, so we have not discussed them in detail here.

Barometer survey of labor market demand (MLSP, RILSP, 2011-2022):

TARILSP under MLSP has been conducting the survey every year since 2011 to determine the trends of Mongolia's labor market (LM) and short-term labor demand.

Survey methodology: The business enterprises registered in the Business Registry of NSO and operating in 18 economic sectors were sampled, with data collected from 2,503 enterprises included in the 2022 survey. The objectives of the research are: (i) to determine the labor force demand for the next year (one year ahead) by economic sectors, occupation, and location; (ii) to assess labor shortages in the labor market during the past year by economic sectors and occupation; (iii) to identify skill demands; and (iv) to compile dynamic data based on annual survey results and identify trends in labor market demand.

Conclusion to the survey results and indicators: Although the survey sample design and methodology remained consistent, the absolute quantitative values differed across the four studies conducted between 2019 and 2022 due to variations in data collection performance and the method of weighting the survey results to the original population. For instance, the estimated number of permanent employees in enterprises was 568.0 thousand in 2019, 383.2 thousand in 2020, 561.4 thousand in 2021, and 811.3 thousand in 2022. However, according to the LF survey results, the number of permanent paid workers in the surveyed industries remained unchanged during those years. This disparity prohibits the direct use of absolute quantitative values for other indicators, such as the number of new and removed employees, labor demand, and shortages, making comparisons between target years challenging. For example, the statement on page 12 of the 2022 research report regarding the creation of 84.6 thousand jobs in 2023, representing an increase of 6.6 jobs (8.4%) compared to the previous year's research, lacks comparability.

Nevertheless, conclusions can still be drawn for target years or samples using relative indicators such as shares and ratios, enabling comparisons over time. Despite these challenges, several common trends emerge from the annual results of the Barometer survey of labor market demand:

- Seasonal fluctuations are a common occurrence in the labor market, with a tendency for two-thirds of jobs to be created in the first half of the year.
- The wholesale and retail trade, construction, and manufacturing industries significantly influence labor force demand, collectively constituting over 50% of the total demand.
- Permanent positions account for 71.9% of the total labor force demand, with 58.2% attributed to new jobs. However, the employment rate, or the number of employees, has remained relatively stable compared to the Labor Force Survey (LFS) results. This stability is primarily due to challenges in accurately defining new jobs, with labor market changes primarily driven by the dynamic inflow and outflow of the workforce.
- Casual, seasonal, and temporary positions in the trade and construction sectors dominate the demand for jobs in the labor market.
- The percentage of labor force shortages, indicating the inability to fill vacant positions, increased from 10.7% in 2017 to 42.7% by 2022. Casual occupations in the trade, construction, and manufacturing industries contribute significantly to this shortage.

Survey and projections of Human resource demand and supply in the industries by the line ministries:

This forecast utilized and incorporated the surveys and projections of human resource demand and supply conducted by the following ministries:

- **Ministry of Mining and Heavy Industry:** Recommendations on human resource development for heavy industry workers by the Department of Heavy Industry Policy (July 2022), Research on the human resources needed in the oil refining industry by the Department of Petroleum Policy, including projections of the labor force required for projects outlined in Vision 2050 and the New Revival Policy.
- **Ministry of Energy:** Conducted a 2024-2035 Energy Manpower Needs Study, projecting manpower needs for Vision 2050 and projects included in the Energy Revival Policy.
- **Ministry of Road and Transport:** Conducted a Human Resource Planning and Manpower Needs Study in the Road Transport Sector, projecting manpower needs for projects included in Vision 2050 and the New Revival Policy.
- **Ministry of Digital Development and Communication:** Conducted a "Study of demand and supply of human resources in communication and information technology" (2021),

determining demand for professional employees in the ICT sector based on job creation in enterprises and future recruitment plans.

- **Ministry of Education and Science:** Utilized "Vision 2050" education projections based on Mongolia's long-term development policy (2020-2050) to inform human resource planning.
- **Ministry of Health:** Conducted "Planning of human resources in the health sector of Mongolia until 2026" (Ministry of Health, MNUMS, WHO, 2022), utilizing various methods such as domestic MNS standards, international standards for medical staff, population-based ratios, and trend-based regression analysis for mid-term human resource planning in the health sector.

The demand for preschool teachers was estimated based on group size, as outlined in Section 2.1.18 of Vision 2050. This section emphasizes improving the quality of kindergarten teachers' work and preparing them for teaching activities. It also introduces the concept of employing two full-time teachers per group starting from 2023 for classes with more than 30 groups. Therefore, preschool teacher demand projections accounted for two full-time teachers per group starting from 2023.

For primary teacher demand, calculations were based on the primary school curriculum, which allocates specific hours for each grade per academic year. Teachers typically spend 19 hours per week teaching, and in lower grades, the class teacher handles most subjects except for music and physical education. In higher grades, additional teachers are needed for specific subjects. Therefore, the number of class teachers equals the number of classes, while the number of other teachers is calculated by dividing the total teaching time per year by the scheduled time for each subject.

Projections for students enrolling in vocational training institutions considered the number of students graduating from basic education, as outlined in the mid-term development plan of the education sector. The plan specifies a target percentage of students transitioning to vocational training institutions over time. Projections were made by estimating the percentage of inclusive training in intermediate years using interpolation methods and multiplying by the population of that age.

For university students, estimates were based on the unit weight of universities and college students in the population aged 18-22 living in Mongolia. Changes in unit weight were assumed to reflect the average over the past 20 years. The unit weight of graduates was also estimated using the share in the population aged 22 years. Projections for professions of university and college students were based on historical unit weight data over the past 20 years.

Priority and in-demand professions of higher education:

Government Resolution No. 115, dated March 29, 2023, approved the Priority Professional Areas of Higher Education, comprising 83 professional areas. Additionally, Annex 2 of the Resolution identified 38 professional areas as in-demand in higher education.

Conclusions based on the previous forecasts, researches, projection methodology and results in Mongolia:

1. Utilize population projections aligned with the average birth rate reduction for Mongolia, specifically version 2B for 2020-2050, ensuring adherence to internationally recognized methodologies for accuracy and reliability.

2. Enhance population forecasting methodologies by considering variations in birth and death rates, incorporating migration change forecasts using NSO's MORTPACK, and integrating actual performance data from 2022 for more precise estimates.
3. Base economic growth and GDP forecasts on Mongolia's own short, mid, and long-term projections, such as those outlined in Vision 2050, rather than relying solely on international organizations like the IMF. Align policy objectives with forecasted economic growth targets to ensure adequate labor resources and sector-specific preparation.
4. Forecast employment figures per industry and total employment by leveraging labor consumption coefficients and the "Industry-Occupation" matrix. These methodologies provide insights into labor market demand by industry, facilitating informed decision-making.
5. Acknowledge the limitations of the "GDP doubles, employment doubles" paradigm and instead, consider empirical evidence suggesting a 100% increase in GDP per capita over 10 years corresponds to a 13.5% rise in employment. This nuanced approach offers a more realistic assessment of employment trends.
6. Recognize that forecasts may not fully capture technological advancements, industry structural shifts, or evolving attitudes among employers and the workforce. Therefore, tailor projections to each industry's technological landscape and future plans, emphasizing key experts and professional roles while managing other occupations through labor market regulation.

9.2. Review of international methods and practices for forecasting labor supply and demand

Countries employ a diverse array of labor market forecasting methodologies, blending quantitative and qualitative approaches to discern and project workforce trends. The selection of methodology hinges on factors such as the nation's economic framework, data accessibility, and the maturity of labor market research and development. At the national level, common methodologies for labor market forecasting include:

- **Economic models:** These models forecast economic growth and its impact on industries and employment. They consider factors like GDP, inflation, interest rates, and investment to project future labor market trends.
- **Occupational and Industry Projections:** Governments analyze historical trends, technological advancements, and industry development to estimate future employment needs for specific occupations and industries.
- **Demographic Analysis:** Analyzing population growth, age distribution, gender ratios, and migration patterns helps forecast changes in the working-age population and its impact on the labor market.
- **Educational Attainment and Training Programs:** Governments use data on educational levels to tailor education and training programs to meet the skill demands of emerging industries.
- **Job Vacancy and Hiring Data:** Monitoring job vacancies, hiring trends, and worker migration provides insights into current labor market demand.
- **Technology and Automation Impact Assessments:** Evaluating the impact of technology and automation on industries helps anticipate changes in skill requirements.

- **Public and Private Sector Collaboration:** Collaboration between government, private sector employers, and professional associations facilitates information sharing on industry-specific labor market needs.
- **Scenario Planning:** Considering various future projections and scenarios helps policymakers prepare for different economic, technological, and demographic changes.
- **Skill Gap Analysis:** Identifying disparities between current workforce skills and employer needs guides adjustments to education and training programs.
- **Global Economic Trends Analysis:** Analyzing global economic trends, trade dynamics, and geopolitical events helps anticipate their impact on the domestic labor market.
- **Survey and Feedback Mechanisms:** Surveys gather qualitative insights from employers, employees, and industry representatives on job perceptions, skill needs, and business challenges.
- **Machine Learning and Data Analytics:** Advanced analytics techniques and AI analyze large datasets to identify trends and correlations, enhancing forecast accuracy.

Countries employ a variety of methods to construct thorough labor market forecasts, aiding businesses in policy formulation, labor force development, and anticipation of future skill demands. By integrating multiple approaches, a more comprehensive grasp of the multifaceted factors influencing the labor market can be achieved.

It's important to recognize that labor market forecasting is a dynamic research domain that continually evolves in response to economic conditions, technological progress, and shifting policy agendas.

Below is a concise overview of the labor market forecasting methodologies used by select countries:

- **USA:** The US Bureau of Labor Statistics (BLS) offers comprehensive occupation-industry projections, considering economic indicators like GDP growth and demographic trends.
- **Great Britain:** The Office for National Statistics conducts labor market analysis, collaborating with public sector stakeholders for deeper insights.
- **Germany:** Strong vocational education and career training systems align educational programs with industry demand, focusing on economic indicators and manufacturing output.
- **Canada:** Employment and Social Development Canada provides labor market data and forecasts, often working with states and regions for broader insights.
- **Australia:** The Australian Bureau of Statistics (ABS) publishes labor market information, identifying skills gaps in partnership with industry stakeholders to influence education policies.
- **China:** The National Bureau of Statistics of China publishes labor market statistics, with a focus on economic growth, industrial output, and demographic trends.
- **Singapore:** The Ministry of Labor Force in Singapore emphasizes collaboration between industry and labor force development agencies, supporting skills development through the SkillsFuture movement.
- **Nordic countries (Sweden, Denmark, etc.):** These nations have robust social security and labor market policies, with collaboration between government, trade unions, and employers, prioritizing skills development and active labor market policies.

Labor supply and demand forecasting serves as a crucial tool for mitigating imbalances between labor supply and demand, ensuring that education levels align with job requirements, and minimizing mismatches between available jobs and skilled workers. By providing insights into future workforce needs, it enables more effective development and allocation of a nation's human resources. In essence, labor supply and demand forecasting acts as:

- **Policy functions** used as basic data for the development of state policies in the fields of employment, education and economy,
- **Information function** to create information used to make decisions in the field of career orientation, career choice, and counseling.[6]

Forecasting is used as an early warning mechanism to help mitigate potential imbalances in the labor market and to support stakeholders in making informed decisions. Performance and behavioral characteristics of the economy and labor market reflect past trends and are based on the key assumption that there will be no major economic downturns. It is based on the concept that past trends are determinants of future changes.

It is impossible to forecast the future precisely, but it is believed that by identifying the trends of the past, it is possible to determine future conditions. Based on the accumulated experience, knowledge, and conclusions, a certain forecast can be made, and the forecast for the coming years can be estimated using various methods. But drastic changes and sharp distortions not seen in the past cannot be forecasted. Therefore, the outcome of the forecasting cannot be a precise static picture of what will happen. However, past characteristics of performance and behavior are assumed to persist and provide a general picture of future trends.[7]

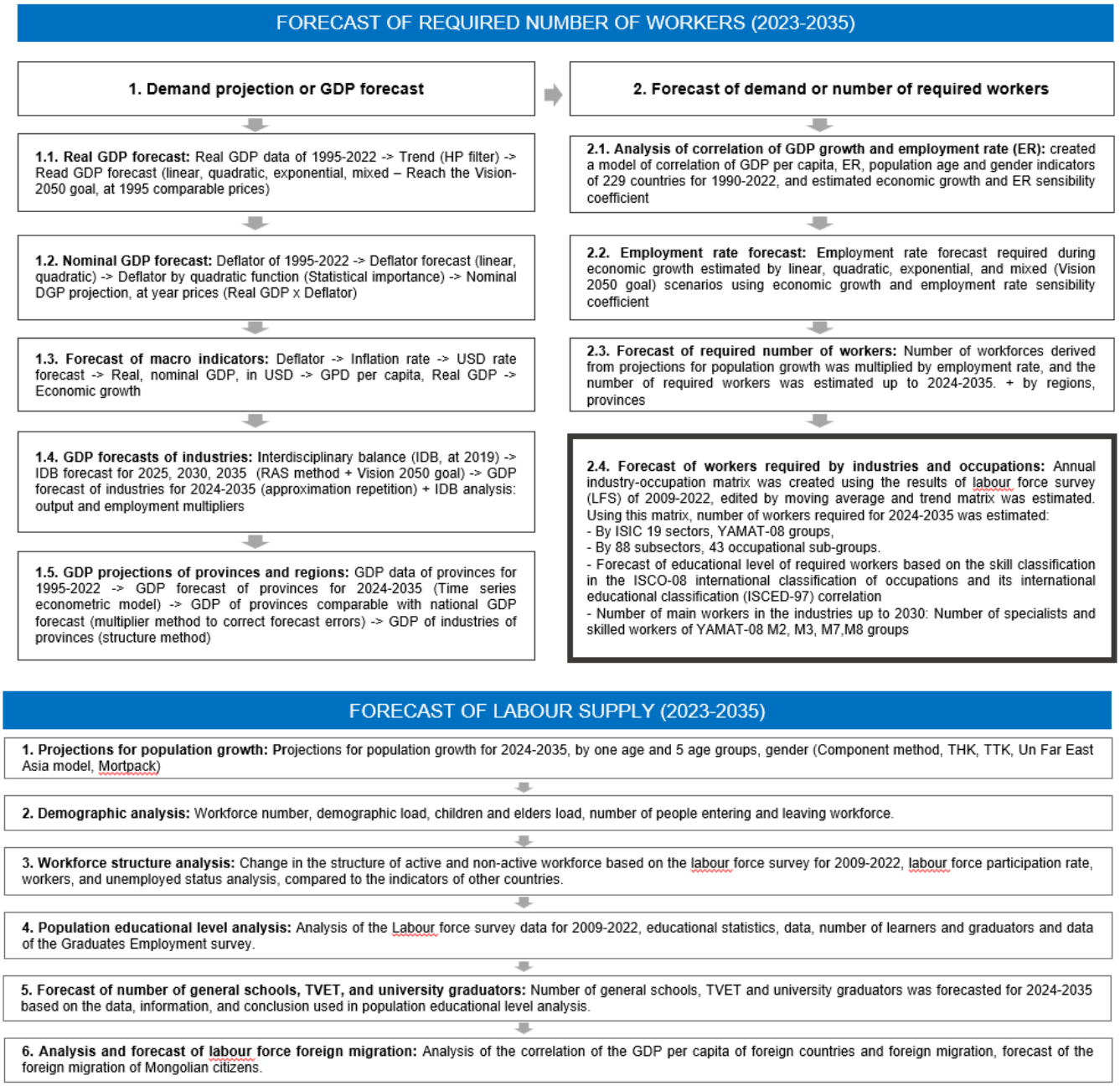
9.3. Selected model and methodology for forecasring the labor supply and demand in Mongolia

When crafting the forecast for Mongolia's labor market until 2035, the primary methods employed included Economic modeling, Demographic analysis, Occupation-industry projections, Scenario planning, and Analysis of global economic trends, drawing from the methodologies discussed earlier. While other techniques such as Educational attainment and training programs analysis, Job vacancy and hiring data, and Technology and automation impact assessments were also considered, their utilization was contingent upon the availability of relevant data during specific stages of forecasting.

Figure 35 outlines the sequential process involved in developing the labor market forecast, delineating the parameters estimated and the methodologies applied. Further elaboration on each stage, along with its rationale, is provided in the subsequent section.

Figure 35: An overview of the sequence and method of developing the forecast of Mongolia's labor market

[6] “Medium to Long-term Labor Supply-Demand Forecast”, Korea Employment Information Service.
[7] “Skills Forecasts: Matching the Right Workers and Skills with the Right Jobs”, Skills Anticipation Background Note, February 2017, ETF



1. Demand projection or GDP forecast: The labor market demand forecast is derived from a multifaceted analysis, incorporating various indicators such as GDP growth, economic sector indicators, job postings and vacancy data, demographic trends, technological advancements, education and training data, government policies, historical data, surveys and interviews, and global and regional economic conditions. Among these indicators, GDP growth serves as a pivotal factor in forecasting labor market demand due to its widespread use in macroeconomic forecasts, its availability of long-term historical data, and its utility in scenario-based calculations informed by government policies.

Despite differing projections among classical, Keynesian, and neoclassical economic theories regarding the relationship between economic growth and employment, there is a shared recognition that GDP growth stimulates demand for goods and services, fostering economic activity and expanding business operations. Consequently, this uptick in economic activity

creates opportunities for job creation and employment expansion. The process of GDP forecasting involves the following sub-steps:

1.1. Real GDP forecasting: Economic planning, performance, and outcomes are typically assessed through metrics such as GDP growth, which includes real GDP growth. Real GDP is a vital measure as it accounts for inflationary effects, providing a more accurate reflection of economic growth over time. When calculating real GDP, data from different years are adjusted using the prices of the base year or a comparison year to remove the impact of inflation.
In the context of Mongolia, real GDP forecasts are anchored to 2015 as the base year. Historical data from 1995 to 2022 is refined using the Hodrick-Prescott filter (HP filter) to estimate real GDP trends. Projections beyond 2022 extend the real GDP forecast, maintaining 2015 as the base year.
The GDP forecast is structured across four distinct scenarios, each representing a spectrum of assumptions and conditions. These scenarios help capture a range of potential economic trajectories, aiding decision-making and policy planning.

- Linear Trend Model: This scenario presents a relatively pessimistic outlook, forecasting an average annual growth rate of 2.7%.
- Quadratic Trend Model: Considered the most probable forecast, this scenario anticipates an average annual growth rate of 4.9%. However, the lingering impact of the Covid-19 pandemic dampens growth, resulting in performance below the targets outlined in Vision 2050, Mongolia's long-term development policy.
- Exponential Trend Model: Offering a relatively optimistic perspective, this scenario envisions an annual growth rate of 7.7%, aligning with the economic growth goals outlined in Vision 2050. Under this model, the targets specified in Vision 2050 and those for 2035 would be achieved by 2032.
- Mixed Trend Model: This scenario combines elements of both exponential (80%) and quadratic (20%) trends, presenting an optimistic outlook. It aims to achieve the 2035 targets set forth in Vision 2050.

Please refer to "Annex 3: GDP and Economic Growth Forecasting Methodology" for an in-depth explanation of the GDP forecasting methodology. Additionally, for the projection results, please consult "3. Mid-term Forecast of GDP."

1.2. Nominal GDP forecast: The GDP deflator with a 2015 base was determined by comparing historical data, specifically nominal GDP expressed in current-year prices from 1995 to 2022, with real GDP in 2015 comparative prices. Projections for the deflator from 2023 to 2035 were derived using linear and quadratic functions. The quadratic deflator estimate held statistical significance as it was utilized to compute nominal GDP by multiplying the real GDP value by the deflator.

1.3. Forecasting of macro economic indicators: Inflation projections for 2023-2035 were derived from the anticipated values of the GDP deflator. These forecasts directly influence the growth of nominal and real wages, which in turn guide supply and demand dynamics in the labor market.

Forecasts for the USD exchange rate were developed to facilitate international comparisons of GDP per capita in USD. By analyzing year-end exchange rate data from 2004 to 2022, projections for the USD exchange rate were estimated using exponential and quadratic functions. Projections tended to exhibit higher values over longer time horizons, and approached linear model assumptions as economic conditions improved. Consequently, forecasts generated by the mixed model, comprising 80% of the linear model and 20% of the quadratic model, were adopted

for subsequent calculations. For a detailed explanation of the forecast methodology and results of the USD exchange rate, refer to "Annex 9. Calculation of some macroeconomic indicators."

Real and nominal GDP values are expressed in USD, with GDP per capita in USD estimated based on the results of population projections.

1.4. GDP forecasting of industries: The final demand was estimated in two versions according to the Leontief production model based on the 2019 input-output table by NSO.

- Version A: Based on average annual GDP growth for 1995-2022 at 2015 constant prices.
- Version B: Based on average annual GDP growth for 2000-2022 at 2015 constant prices.

The results of the mixed trend model and version B were similar, and the mixed trend model was considered the appropriate version. The calculation of the added value of the economic sectors (sectoral GDP) from the forecast results of Mongolia's GDP until 2035 was carried out in accordance with the following two principles:

1. Forecasts for each sector until 2035 were made using an exponential model based on the 13-year data from 2010 on the share of sectors in Mongolia's GDP.
2. Adjustments were made in accordance with the results of the economic calculations of Vision-2050: Mongolia's long-term policy document.

The labor multiplier of the industries' production was calculated based on the input-output table forecast. For detailed results of GDP forecasts of industries and related analysis, refer to sections 3.3 and 3.4. Additionally, see the methodology outlined in "Annex 3: Methodology for Developing Forecasts of GDP and Economic Growth" and "Annex 9: Projections of Some Macroeconomic Indicators."

1.5. GDP projections of regions and provinces: When forecasting the GDP of Mongolia's provinces, regions, and the city of Ulaanbaatar until 2035, real GDP was calculated by multiplying the nominal GDP of 2000-2022 by the deflator at the 2015 constant prices.

2. Forecasting of demand or labor force: Labor market demand, or the required workforce, is projected based on estimates of how much labor will be necessary to support the forecasted GDP and economic growth.

2.1. Analysis of the relationship between GDP growth and employment rate: Developed a model analyzing the correlation between GDP per capita, employment rate, and population age and gender indicators across 229 countries from 1990 to 2022. Estimated the coefficient of sensitivity of economic growth and employment rate based on this extensive dataset.

2.2. Forecasting of employment rate: Employment rate forecasting was conducted by considering economic growth estimated under linear, quadratic, exponential, and mixed (aligned with Vision 2050 goals) scenarios. This was achieved using the sensitivity coefficient derived from the relationship between economic growth and employment rate.

2.3. Forecast of the number of required workers: The working-age population projected from the population forecast was multiplied by the labor force participation rate to estimate the number of required workers for the period of 2024-2035. Additionally, forecasts of the number of workers were made for each province, the capital city, and regions.

2.4. Forecast of the number of required workers by industries and occupations: Utilizing the annual industry-occupation matrix derived from the labor force survey data spanning from 2009 to 2022. The trend matrix was then estimated through moving averages. The number of required workers for the period of 2024-2035 was estimated by applying matrices:

- 19 industries in the classification of all types of economic activities (ISIC 4.0), and 9 groups of the National Occupational Classification and Definition (YAMAT-08),
- 88 sub-sectors and 43 occupational sub-groups.

Please refer to "Annex 2: Forecasted Employment Rate - Methodology for Estimating the Required Labor Force by Industries and Occupations" for a detailed description of the methodology used in estimating the required labor force by industries and occupations. Additionally, the forecast of the educational attainment level of the required workers was developed based on the correlation between the skills classification in the International Standard Classification of Occupations (ISCO-08) and the International Standard Classification of Education (ISCED-97). For estimation results, please see section 6.3, and for methodology, refer to Annex 10.

Furthermore, the number of key employees required until 2030, specifically the M2, M3, M7, and M8 groups of YAMAT-08 experts and professionals, was also estimated.

3. Forecast of labor supply

3.1. Projections of population growth: Population projections for the period 2024-2035 were generated using the UN Far East Asia model and the Mortpack program. These projections were based on the component method, which considers factors such as the total fertility rate (TFR) and the special fertility rate (SFR) by age and gender groups. The TFR and SFR were analyzed for both individual age groups and aggregated groups spanning five years.

3.2. Demographic analysis: Estimated the number of working-age population, dependency ratio, child and elderly dependency ratio, and the number of people entering and exiting working age.

3.3. Labor force structure analysis: The workforce and inactive population, structural changes, labor force participation rate (LFPR), employment status, and unemployment were analyzed using LFS data from 2009 to 2022. These findings were then compared with similar data from other countries to provide context and insights into Mongolia's labor market dynamics.

3.4. Population educational level analysis: Analyzed the LFS data for 2009-2022, educational statistics, number of students, and graduates and employment of the graduators.

3.5. Forecast of number of general school, TVET, and university graduators: Forecast of numbers of secondary schools, TVET and university graduates for 2024-2035 was estimated based on the data and conclusions used in the population educational analysis.

3.6. Analysis and forecast of foreign migration: After analyzing the relationship between the GDP per capita of various countries worldwide and foreign migration patterns, we proceeded to forecast the foreign migration of Mongolian citizens. This analysis involved considering economic indicators, demographic trends, and other relevant factors to project the likely patterns of migration over the forecast period.

CHAPTER 10
ANNEXES

10. ANNEXES

ANNEX 1. METHOD OF CALCULATING EMPLOYMENT RATE

Foreword: Two main studies have been conducted by the Labor Research Institute (2014)[8] and the Institute of Environment and Agricultural Economics (2021)[9] on labor demand forecasting in Mongolia. The consulting team considered the methodology in these studies as inadequate for long-term forecasting, so they executed this forecast by expanding the basic forecast in 3 areas.

Advantages: This study has the following 3 advantages compared to previous studies:

1. The correlation of variables was assessed flexibly,
2. Consistent data for the past 30 years of 229 countries was used, and
3. The dynamic effect of population pyramid was estimated.

Main data: Projections were made using 1-year frequency data for 1990-2022 for a total of 229 countries. The consulting team used information from the following sources.

- **Population data:** Variables representing population growth and population structure changes were taken from the United Nations Population Division[10].
- **GDP per capita:** The World Bank updated the GDP per capita on September 19, 2023. The GDP calculated in constant 2017 international dollars or purchasing power parity (constant 2017 international dollar) was used[11]. The reason for using this measure is that constant USD measure is more suitable for the study of economic dynamics and comparative countries. This allows researchers to measure actual growth or contraction independent of price changes. Inflation corrections are common in studies measuring the effects of real economic growth.
- **Employment rate.** This variable was taken from the ILOSTAT Database, a database of the International Labor Organization.

[8] "Forecasts of mid and long-term labour demand and supply".
[9] "Survey Report on Current and Future Job Demand and Supply in Mongolia's Labor Market".
[10] https://population.un.org/wpp/
[11] https://data.worldbank.org/

Projection methodology: The following linear model was considered:

$$\ln(e_{i,t}) = \alpha + \beta \ln(y_{i,t}) + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + \varepsilon_{i,t}, \quad (1)$$

Where, i and t indice considered country and year, e_{it}-employment rate, $y_{i,t}$-GDP per capita, $\varepsilon_{i,t}$-remaining random members. And, $X_{i,t}$- represents the variables representing the dynamics of population pyramid. See details in Annex 1.

Table 70: Values of dependent variables and calculation methods

№	Variables	Calculation method
1	Total dependency ratio	$\frac{\text{Population aged } 0-14, 65 \text{ and older}}{\text{Population aged } 15-64}$
2	Youth dependency ratio	$\frac{\text{Population aged } 0-14}{\text{Population aged } 15-64}$
3	Old-age dependency ratio	$\frac{\text{Population aged 65 and over}}{\text{Population aged } 15-64}$
4	Median Age	The age that divides a population into two numerically equal groups; that is, half the people are younger than this age and half are older.
5	Sex Ratio	The number of males per 100 females in a population.
6	Total population	The total population of the country

Population structure and its importance: At the international level, the employment rate is highly dependent on population structure. This correlation was estimated for 229 countries. Results are in the table below.

Table 71: Correlation of the employment on the structure of the population

Variables	Coefficient	Standart Error (SE)
Total dependency ratio	-63.470***	6.066
Youth dependency ratio	75.654***	8.116
Sex Ratio	9.965***	1.200
Median Age	0.931***	0.110
Constant term (intercept)	22.532***	3.866

The estimation results show that all variables have high statistical significance. Also, the fact that even the growth signs of the variables are changed has attracted a lot of attention, in particular:

- How the population load has been increasing until now, and decreasing since 2024.
- Gender ratio tends to increase since 2030.
- Mean age starts to decrease in the enxt 3 eyars, starting from 2026
- Elderly load is to increase rapidly in the near future.

Making long-term forecasts based solely on economic and labor market data is insufficient. It is important to do this in parallel with population structure forecasts.

Main empiric model: Equation (1) can be expressed in terms of time variation as follows:

$$\Delta_k \ln(e_{i,t}) = \alpha + \beta \Delta_k \ln(y_{i,t}) + \gamma \Delta_k \boldsymbol{X}_{i,t} + \epsilon_{i,t}, \quad (2)$$

Where, Δ_k-difference between t $(t-k)$ cycle, $\epsilon_{i,t}$-remaining member.

results: We performed the estimation on values $k = 5, 10, 13, and\ 15$. In other words, estimation was made at 5-, 10-, 13-, and 15-year intervals to determine how changes in explanatory variables affect dependent variables. The estimation results are detailed in the following tables.

The point estimates of the sensitivity of the employment rate tend to decrease as the value of k increases. This means that short-term fluctuations play a role in the dynamics of the employment level. For example, it can be observed that GDP per capita and gender ratio have a positive effect on the employment rate. The following tables are the evaluation made by cleaning the fixed effect of the countries, which differentiate them from the previous table. It should be mentioned that the variables representing the population pyramid are correlated with each other. Therefore, the effect of the gender ratio may contain both the effect of population life expectancy and the f old age load.

Table 72: 5-year growth sensitivity of employment rate

Variables	Coefficient	Standart Error (SE)
Δ_5**log (GDP per capita)**	10.238***	1.107
Δ_5**log (total population)**	1.571	2.720
Δ_5 **(youth dependency ratio)**	1.685	4.980
Δ_5 **(old dependency ratio)**	2.347	10.975
Δ_5 **(sex ratio)**	13.262***	3.924
Δ_5 **(median age)**	-0.294	0.223
constant	-0.140	0.393
Number of observations – 2,163 ; Adjusted R^2- 0.044		

Table 73: 10-year growth sensitivity of employment rate

Variables	Coefficient	Standart Error (SE)
Δ_5**log (GDP per capita)**	7.528***	0.872
Δ_5**log (total population)**	3.424*	1.827
Δ_5 **(youth dependency ratio)**	0.791	3.560
Δ_5 **(old dependency ratio)**	-8.589	8.070
Δ_5 **(sex ratio)**	25.686***	4.086
Δ_5 **(median age)**	-0.121	0.157
constant	-0.027	0.541
Number of observations – 1,695 ; Adjusted R^2- 0.075		

Table 74: 13-year growth sensitivity of employment rate

Variables	Coefficient	Standart Error (SE)
Δ_5**log (GDP per capita)**	8.096***	0.867
Δ_5**log (total population)**	2.734	1.753
Δ_5 **(youth dependency ratio)**	-0.294	3.568
Δ_5 **(old dependency ratio)**	-6.103	8.104

Δ_5 (**sex ratio**)	26.469***	4.476
Δ_5 (**median age**)	-0.175	0.158
constant	-0.259	0.655
Number of observations – 1,389 ; Adjusted R^2- 0.096		

Table 75: 15-year growth sensitivity of employment rate

Variables	Coefficient	Standart Error (SE)
Δ_5**log (GDP per capita)**	7.453***	0.891
Δ_5**log (total population)**	0.760	1.866
Δ_5 (**youth dependency ratio**)	-3.130	3.712
Δ_5 (**old dependency ratio**)	-2.019	8.316
Δ_5 (**sex ratio**)	42.458***	6.262
Δ_5 (**median age**)	-0.398**	0.162
constant	0.860	0.743
Number of observations: 1,207; Adjusted R^2: 0.1028.		

Forecasting of employment coefficient: In this survey, the time frame we focus on is the period up to 2035. Currently, the latest annual employment rate data for Mongolia is available until 2022. Therefore, Equation (2) was estimated on values k=1,2,…,13 and the forecasts of employment rate derived based on the forecasts on how Mongolia's GDP per capita will grow in real terms from 2023 to 2035, and how the measures of the population will change.

Two types of GDP forecasts were used. They are the GDP's "**Quadratic**" and "**Mixed**" approached mentioned above. Point predictions and corresponding 95% confidence intervals are shown.

Table 76: Forecast of employment and GDP per capita growth using quadratic trend model

Year	Point forecast of employment	95% confidence interval
2022	54.70	
2023	55.44	[55.07, 55.81]
2024	56.31	[55.85, 56.78]
2025	55.92	[55.42, 56.43]
2026	56.52	[55.94, 57.11]
2027	56.63	[55.94, 57.31]
2028	57.12	[56.29, 57.94]
2029	57.13	[56.24, 58.01]
2030	57.01	[56.00, 58.01]
2031	57.34	[56.18, 58.49]
2032	57.41	[56.16, 58.65]
2033	57.64	[56.18, 59.10]
2034	58.08	[56.53, 59.63]
2035	58.38	[56.76, 59.99]

Note: The employment data for 2022 is sourced from NSO's Statistical Database. This assumption was derived from the evaluation of Equation (2) for the values of k=1,2,...,13, considering population growth and GDP growth assumptions.

Table 77: Forecast of employment and GDP per capita growth using mixed trend model

Year	Point forecast of employment	95% confidence interval
2022	54.70	
2023	55.74	[55.32, 56.16]
2024	56.87	[56.32, 57.42]
2025	56.73	[56.14, 57.33]
2026	57.55	[56.85, 58.24]
2027	57.72	[56.91, 58.53]
2028	58.36	[57.41, 59.32]
2029	58.56	[57.55, 59.58]
2030	58.57	[57.43, 59.72]
2031	59.05	[57.74, 60.36]
2032	59.04	[57.63, 60.45]
2033	59.43	[57.77, 61.09]
2034	60.01	[58.25, 61.78]
2035	60.67	[58.83, 62.52]

Note: The employment data for 2022 is sourced from NSO's Statistical Database. This assumption was derived from evaluating Equation (2) for the values of k=1,2,...,13, considering population growth and GDP growth assumptions.

ANNEX 2. ESTIMATED EMPLOYMENT RATE – METHODOLOGY OF ESTIMATING REQUIRED LABOR FORCE BY INDUSTRIES AND OCCUPATIONS

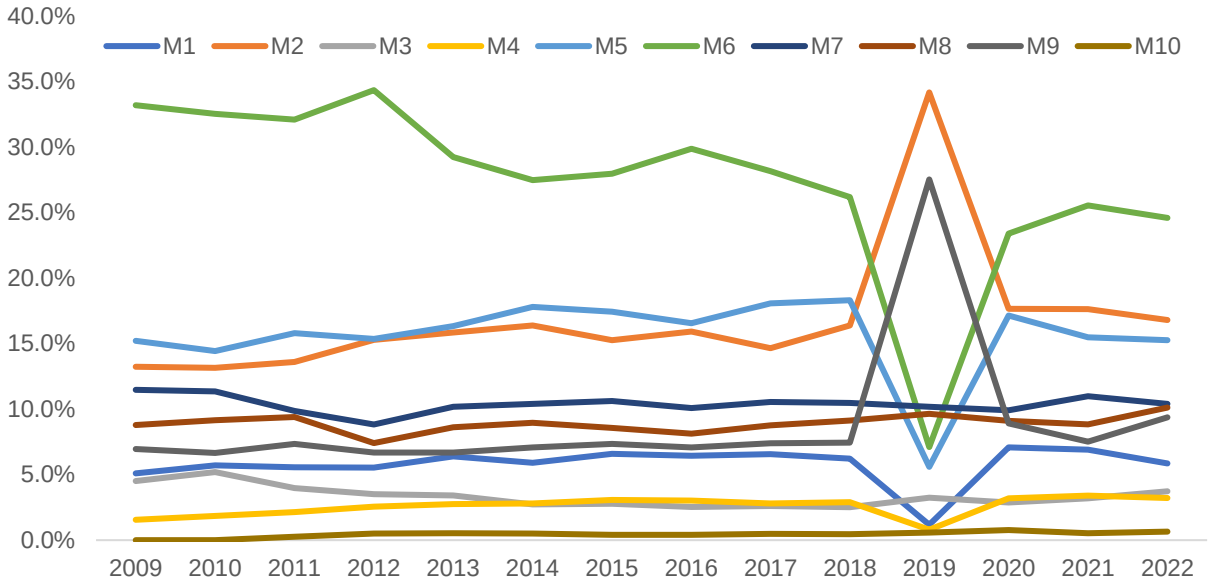
During the estimation of forecasts for occupations in economic sectors spanning 2023-2035, several empirical difficulties surfaced. Notably, short-term fluctuations and cyclical effects posed challenges, particularly given the relatively limited sample size of data spanning 2009-2022. Additionally, anomalies were observed, such as a zero unit weight for the defense industry in 2009-2010, and significant fluctuations in the percentage of total employees across industries in 2019. These anomalies suggest potential errors in measurement and registration that may have impacted the reliability of the data.

Empirical difficulties:

1. Data is short, only statistics for 2009-2022.
2. Short-term fluctuations and cyclical effects are high.
3. High probability of error in measurement and registration.

   For example, the number of workers released by occupational category in 2019 does not correspond to the number of corresponding industries.
4. Defense sector's data was "0" in 2009-2010.

Figure 36: Proportion of occupations by major groups in the total *employees*



- Green: Skilled agricultural, forestry, and fishery workers.
- In 2019, the agricutlural industry was relatively stable.

$M_{i,2019} = 0.2 * M_{i,2017} + 0.3 * M_{i,2018} + 0.3 * M_{i,2020} + 0.2 * M_{i,2021}$ estimation was used for editing the changes in the occupational structure of 2019.

The concept of forecasting the share of industries

Signs

T1. Share of industry j in the current t year:

$$x_{j,t}, \quad 1 \leq j \leq 21, \quad 2009 \leq t \leq 2035.$$

T2. Forecasting of the share industry j in the current t year:

$$\hat{x}_{j,t}, \quad 1 \leq j \leq 21, \quad 2023 \leq t \leq 2035.$$

Limitations

X1. $0 \leq \hat{x}_{j,t} \leq 1, \quad \forall(j,t).$

X2. $\Sigma_j \hat{x}_{j,t} = 1, \quad \forall t.$

X3. $\{\hat{x}_{j,t}\}_{t=2023}^{2035}$, $1 \leq j \leq 21$, no periods, no fluctuations.

- Coherence of economy and population data must be satisifed to find the shares.
- Avoid risk of negative correlation as if the industry with relatively slow growth in the number of workers is shrinking in its share.
- X1-X3 limitations must be satisfied.
- Depending on the above requirements and data quality, $\hat{x}_{j,t}$ cannot be forecasted directly.

- One way to overcome this difficulty is to study mid/long term trends of the share.
- This approach is consistent with this project's focus on mid- and long-term forecasts.

Variable decomposition and sign

D1. Share of industry j in the current t year consists of the two following parts:

$$x_{j,t} = \alpha_{j,t} + \varepsilon_{j,t}, \quad 1 \le j \le 21, \quad 2009 \le t \le 2035.$$

T3. $\alpha_{j,t}$: trend;

T4. $\varepsilon_{j,t}$: cyclical and measurement effect;

T4. $\hat{\alpha}_{j,t}$: cyclical and measurement effect;

Limitations: $\alpha_{j,t}$

X1. $0 \le \hat{\alpha}_{j,t} \le 1, \quad \forall(j,t).$

X2. $\Sigma_j \hat{\alpha}_{j,t} = 1, \quad \forall t.$

X3. $\{\hat{\alpha}_{j,t}\}_{t=2023}^{2035}$, $1 \le j \le 21$, no periods, no fluctuations.

The following conditions must be met for trend forecasting.

X4. $0 \le \hat{\alpha}_{j,t} \le 1, \quad \forall(j,t).$

X5. $\Sigma_j \hat{\alpha}_{j,t} = 1, \quad \forall t.$

X6. $\{\hat{\alpha}_{j,t}\}_{t=2023}^{2035}$, $1 \le j \le 21$, no periods, no fluctuations.

Main methodology

1. Share is forecasted based on the number of workers. Share of industry workers is forecasted on the trend of the number of industry workers using available data. The following signs are used.
   - Number of workers of industry j in year t: $\tilde{E}_{j,t}$.
   - $\tilde{e}_{j,t} = ln(\tilde{E}_{j,t})$.
   - $\tilde{e}_{j,t}$ -trend is $e_{j,t}$.

2. $e_{j,t}$ -is estimated using HP filter. HP filter is commonly used in dynamic economic studies. The main parameter of this method is the HP filter parameter λ. A commonly used value of this parameter for analyzing annual frequency data is λ=6.25. See the following study:
   - HP filter parameter: $\lambda = 6.25$.
   - Morten O. Ravn, Harald Uhlig (2002): "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations,"*The Review of Economics and Statistics, 84 (2): 371–376.*

- Therefore, we used λ=6.25 HP filter abd estimated e_(j,t) per j and t.

3. Using the previous results, evaluate the following model for each industry:

$$e_{j,t} = \beta_0 + \beta_1\, ln(y_t) + \beta_1\, ln(P_t) + v_{j,t}$$

- y_t: real GDP per capita (PPP, constant prices),
- P_t: total population.

4. Using the evaluation and (y_t, P_t) forecast, predict $\hat{e}_{j,t}$ (prediction).

5. Estimate prediction standard deviation, $\hat{\sigma}_{i,t}$.

6. Using these results, etimate $\hat{E}_{j,t}$ and its "2SD" interval.

$$\begin{cases} \hat{E}_{j,t} = exp(\hat{e}_{j,t}) \\ \hat{E}^U_{i_1 t} = exp(\hat{e}_{j,t} + 2\hat{\sigma}_{j,t}) \\ \hat{E}^L_{j,t} = exp(\hat{e}_{j,t} - 2\hat{\sigma}_{j,t}) \end{cases}$$

7. Calculate the folloing sum per t:

$$\bar{E}_{j,t} = \sum_{j=1}^{21} \hat{E}_{j,t}.$$

8. At the final stage,

$$\begin{cases} \hat{\alpha}_{j,t} = \dfrac{\hat{E}_{j,t}}{\bar{E}_{j,t}}, \\ \hat{\alpha}^U_{j,t} = \dfrac{\hat{E}^U_{j,t}}{\bar{E}_{j,t}}, \\ \hat{\alpha}^L_{j,t} = \dfrac{\hat{E}^L_{j,t}}{\bar{E}_{j,t}}. \end{cases}$$

ANNEX 3. METHODOLOGY FOR GDP AND ECONOMIC GROWTH FORECASTS

Features of the economic system and modeling methods

Testing the effects of any change in the economic system in real life and observing the results is challenging and often impractical. Therefore, current research and analysis activities focus on creating an artificial environment similar to the economic system through mathematical modeling, conducting computer experiments, and comparing the results to enhance decision-making efficiency.

However, this endeavor faces challenges due to the complexity of human behavior and intervention in economic systems. Economists aim to develop a theoretical understanding and mechanisms to effectively manage macro, meso, and microeconomic activities, akin to controlled

physical systems. To achieve this goal, economists continually strive for cognitive advancement and knowledge creation.
The creation of an artificial economic environment currently unfolds in two main directions:

- ***Creating a mathematical model of economic activity*** *involves evaluating model parameters using econometric and statistical methods, utilizing computer science and technical tools, and conducting simulations and numerical experiments.*
- *Experimental economic approaches aim to construct an artificial environment, establish scenarios, organize activities based on predefined rules, and observe reactions to rule changes within a specific group of individuals.*

The modeling approach itself is developing in the following two directions:

- ***Theory based approach***
- ***Data-driven empirical analysis approach.***

Empirical analysis approaches often utilize macro data or data-driven econometric methodologies. Recently, economic universities in our country have placed significant emphasis on teaching modern, time-series econometric courses. Consequently, there has been a notable increase in the use of related computer software. Additionally, a hybrid approach known as the ***"CGE-Computable General Equilibrium model"*** is gaining traction, combining elements of both traditional econometric methods and computational modeling techniques.

Understanding economic activities and phenomena can vary among researchers, often influenced by stakeholders' interests and information availability. However, overlooking the framework and interrelationships of processes can lead to biased interpretations, incomplete explanations, and policy errors. Developing systems analysis models and involving their developers in ongoing activities can improve the effectiveness of macro policies in our country, particularly in today's complex and global environment.

Another empirical approach gaining momentum is the use of ***machine learning methods*** for prediction, spurred by advancements in computer science. Time series econometric models are valuable for quickly forecasting future trends within time constraints. In contrast, theoretical models are typically employed by research institutions with ample time and expert resources to analyze the impact of policies and external shocks.

Given time constraints, we relied on time series econometric models to forecast key macroeconomic indicators.

One dimensional time series econometric modeling

1. Components of time series

Time series econometric analysis aims to predict future values by examining the relationships among lagged values of specific and related indicators.
A time series consists of values corresponding to successive time points of a chosen parameter. These series are essential for detecting temporal patterns and constructing models to forecast future values. The goal of time series analysis is to develop the most efficient forecasting model, often with limited data.

There are two fundamental types of time series: deterministic and stochastic. Deterministic or causal time series exhibit a predictable relationship between future and past values, often modeled through differential equations. In economic contexts, these models capture specific decision-making environments.
Conversely, stochastic or random time series lack a deterministic relationship between past and future values. These series are characterized by randomness and unpredictability, often represented as a sequence of random variables. In continuous time, stochastic time series form random processes, which can be broken down into four key components:

- Trend Component: Represents the long-term movement or directionality within the time series.
- Seasonal Component: Reflects periodic fluctuations occurring at regular intervals, such as daily, weekly, monthly, or yearly patterns.
- Cyclical Component: Captures longer-term fluctuations that do not follow regular patterns, often associated with economic cycles like business cycles.
- Irregular or Random Component: Accounts for unpredictable fluctuations in the time series that cannot be attributed to trends, seasonality, or cycles. These fluctuations, also known as noise, stem from random shocks or unforeseen events.

The trend of a time series denotes the general direction of its value levels. Trends in time series can be ascending, descending, or constant, representing overall increases, decreases, or stability in values over time.

A time series is deemed to have seasonal influence if specific characteristics repeat in the same seasons or months every year, following seasonal patterns or cycles.

Cyclical time series exhibit repetitive changes in value levels over periods longer than a year, reflecting broader economic trends. The duration of these cycles can vary, and they are influenced by the general characteristics of the economy.

Fluctuations in time series values resulting from unpredictable factors are known as shock effects or random elements. These elements introduce variability into the time series, representing unforeseen influences on the observed data.The time series components have the following two structures.

- $y_t = TR_t + S_t + C_t + I_t \quad \rightarrow$ additive
- $y_t = TR_t \cdot S_t \cdot C_t \cdot I_t \quad \rightarrow$ multiplicative

Where, y_t– time series level value, TR_t–trend, S_t–seasonal effct, C_t–cyclical, I_t–random

1. Econometric modeling of time series components

Each component of a time series is modeled using specific methods, with trends and seasonal effects typically categorized as deterministic components. It is assumed that these components maintain consistent values throughout the target period and are thus modeled using functions dependent on the time index.

The remaining components, namely cycles and random effects or shocks, are considered stochastic. The cycle component is modeled based on the inertia of time series values, relying on previous period values for explanation. Random effects are represented by residual random

variables, often modeled as "white noise" to ensure autocorrelation and adherence to normal distribution.

In cases where the residual random variable exhibits heteroscedasticity within the target time interval, the standard error of this variable can be modeled using ARCH (autoregressive model with conditional heteroscedasticity) and GARCH (generalized autoregressive model with conditional heteroscedasticity) models.

Trend modeling. To model trends, general shape is determined by Hodrick-Prescott filter. The filter determines the trend value as a solution to the following dynamic optimization problem.

$$Z = \sum_{t=1}^{T} (y_t - TR_t)^2 + \lambda \cdot \sum_{t=2}^{T-1} ((TR_{t+1} - TR_t) - (TR_t - TR_{t-1}))^2 \rightarrow \min$$

Where, λ–fine coefficient, TR_t–trend, t -time sequencing or index

Hodrick and Prescott choose the fine coefficient as follows:

$$\begin{cases} \mathrm{y_t\ given\ yearly} & \lambda = 100 \\ \mathrm{y_t\ given\ seasonly} & \lambda = 1600 \\ \mathrm{y_t\ given\ monthly} & \lambda = 14400 \end{cases}$$

The shape of the trend modeling function is chosen based on the trend values determined by the Hodrick and Prescott test. Trends are often modeled by the following functions.

- *Linear:* $TR_t = b_o + b_1 t$
- *Quadratic:* $TR_t = b_o + b_1 t + b_2 t^2$
- *Hyperbole:* $TR_t = b_o + \frac{b_1}{t}$
- *Half parabola:* $TR_t = b_0 + b_1 \sqrt{t}$
- *Exponential:* $TR_t = b_0 \cdot e^{b_1 t} \Leftrightarrow ln(TR_t) = ln\, b_0 + b_1\, ln\, t$
- *Logarithm:* $TR_t = b_o + b_1\, ln\, t$

Modeling seasonal effects. Seasonal (monthly) effects represent intra-annual cyclical fluctuations in time series values. A dummy variable is used to model seasonal effects. Adummy variable is entered:

a. Base Dummy Variable – For indicators given by season, include season 1 as the base season and dummy variables for the remaining seasons.

$D_2 = \{0,1,00, \ldots, 0,1,0,0, \ldots\}$ - *2nd seasonal dummy*

$D_3 = \{0,0,10, \ldots, 0,0,1,0, \ldots\}$ - *3rd seasonal dummy*

$D_4 = \{0,0,01, \ldots, 0,0,0,1, \ldots\}$ - *4th seasonal dummy*

Removing trend and converting time series value

$$X_t = y_t - TR_t = S_t + C_t + I_t$$

into

$$X_t = \gamma_0 + \gamma_1 D_{2t} + \gamma_2 D_{3t} + \gamma_3 D_{4t}$$

determine seasonal effect by approximating the regression function. Where γ_0 - deviation of the time series value in I season, $\gamma_1, \gamma_2, \gamma_3$ the impact of that season compared to the I season.

б. Full Dummy Variable – Removes the weak term in the regression due to multicollinearity problems when dummy variables are included for each season and evaluates like

$$X_t = \gamma_1 D_{1t} + \gamma_2 D_{2t} + \gamma_3 D_{3t} + \gamma_4 D_{4t}$$

Where, γ – the average deviation from the mean of the time series in the corresponding season

Define cycle. To effectively model the cyclical component of a time series, it's essential to grasp key properties of stochastic time series. One such crucial property is covariance stationarity, also known as weak stationarity. Let's explore how to calculate the average, variance, and covariance of the time series, as well as how to determine autocorrelation and the autocorrelation function, calculate its value, and visualize the correlogram.

When representing the time series as an infinite set with countable powers, we can describe it as the original set. This understanding forms the basis for analyzing and modeling the time series effectively.

$$y_{t\,+\infty}^{-\infty} = \{\dots, y_{t-3}, y_{t-2}, y_{t-1}, y_t, y_{t+1}, y_{t+2}, \dots\}$$

For the elements of this original population, the mean and time-lagged covariance are defined as

$$E(y_t) = \mu_t = \sum_{t=-\infty}^{+\infty} y_t p_t,\ \sum_{t=-\infty}^{+\infty} p_t = 1, p_t \geq 0$$

$$\gamma(t, t-\tau) = cov(y_t, y_{t-\tau}) = E(\big(y_t - E(y_t)\big) \cdot \big(y_{t-\tau} - E(y_{t-\tau})\big))$$

Where, τ - time delay value.

In that case, when $\tau = 0$ the covariance is the variation of y_t. Calculating the covariance determines whether the level values of the time series are correlated with each other over time lags. Covariance only provides a direction of correlation and does not measure the strength of the correlation. To measure the strength of the correlation, it is necessary to calculate the correlation coefficient. For time-delayed values, the correlation coefficient is calculated as follows. This is called autocorrelation function (ACF).

$$ACF(t, t-\tau) = \rho(t, t-\tau) = \frac{cov(y_t, y_{t-\tau})}{\sqrt{Var(y_t) \cdot Var(y_{t-\tau})}}$$

Definition. A time series that satisfies the following properties is called covariance stationary or weakly stationary *time series*:

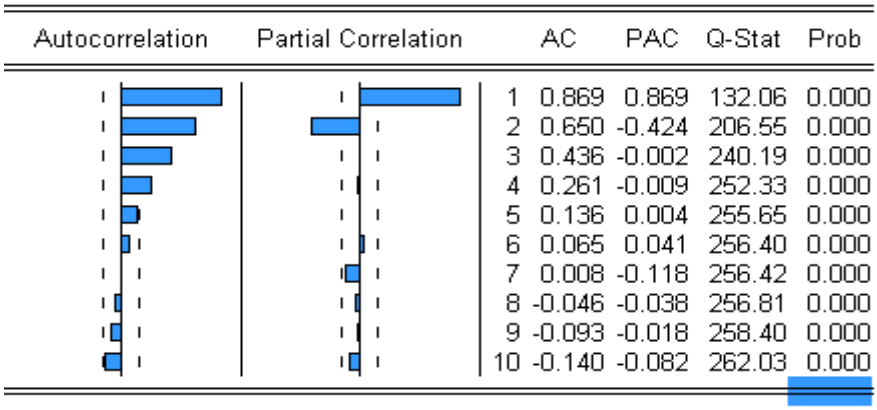
1. $E(y_t) = \mu_t = const$
2. $Var(y_t) = \sigma_t^2 = const$
3. $\gamma(t, t-\tau)$ ⇒ depends only from τ . In other words, it is $\gamma(t, t-\tau) = \gamma(\tau)$.
4. $\gamma(\tau) = \gamma(-\tau)$ ⇒ even function

For covariance stationary time series, the autocorrelation function (ACF) is defined as follows:

$$ACF = \rho(\tau) = \frac{\gamma(\tau)}{\gamma(0)}$$

Definition. A graphical representation of the autocorrelation function is called a correlogram. Its graphic representation is defined as follows.

Figure 37: Correlogram of the autocorrelation function



	AC	PAC	Q-Stat	Prob
1	0.869	0.869	132.06	0.000
2	0.650	-0.424	206.55	0.000
3	0.436	-0.002	240.19	0.000
4	0.261	-0.009	252.33	0.000
5	0.136	0.004	255.65	0.000
6	0.065	0.041	256.40	0.000
7	0.008	-0.118	256.42	0.000
8	-0.046	-0.038	256.81	0.000
9	-0.093	-0.018	258.40	0.000
10	-0.140	-0.082	262.03	0.000

If the correlogram of the time series approaches zero as τ increases, indicating that the covariance is stationary.

In addition to the autocorrelation function, we also consider the partial autocorrelation function (PACF). The PACF represents how the value of the time series at time t is influenced by the value with a lag of τ. Essentially, it indicates how much the level value of the time series changes when the lag value τ changes by one unit.

To estimate the autocorrelation function value, an autoregression model is employed.

$$y_t = \gamma_1 y_{t-1} + \gamma_2 y_{t-2} + \cdots + \gamma_p y_{t-p}$$

equation's coefficient prior to the delayed values of y indicates the value of the autocorrelation coefficient of that sequence.

Definition. $y_t = \{\varepsilon_t\}_{-\infty}^{+\infty}$ A time series is called *white noise* if it satisfies the following conditions.

1. $E(\varepsilon_t) = 0$
2. $Var(\varepsilon_t) = \sigma^2 = const$
3. $\gamma(\tau) = 0, \tau \neq 0$

In other words, *white noise* is a stationary time series that is completely unrelated to each other in terms of time delay. If the white noise obeys the normal distribution law, it is called *Gaussian white noise*. A Gaussian white noise process with mean 0 and variance σ^2 is denoted $\varepsilon_t \sim WN(0, \sigma^2)$.

For a time series regression model, the residual random variable is required to be white noise, and in the presence of Gaussian white noise, the estimation of the regression coefficient satisfies the condition of BLUE-Best Linear Unbiased Estimate.

Cyclical effects are modeled by the following two processes and their linear combination:

Definition (MA(q) process- Moving Average Process). If the cycle of a time series is represented by the delay value of a white noise process up to q it is called $MA(q)$ process. This process is written as

$$y_t = \varepsilon_t + \vartheta_1 \cdot \varepsilon_{t-1} + \cdots + \vartheta_q \varepsilon_{t-q}\,, \quad \varepsilon_t \sim WN(0, \sigma^2)$$

Definition (AR(p) process- Autoregressive Process). If the cycle of a time series is represented by the delay value of order up to the previous period p in the series, then the process is called $AR(p)$. This process is written as

$$y_t = \varepsilon_t + \varphi_1 \cdot y_{t-1} + \cdots + \varphi_p y_{t-p}\,, \quad \varepsilon_t \sim WN(0, \sigma^2)$$

Definition (ARMA(p,q) process- Autoregressive and Moving Average Process). If the cycle of the time series is simultaneously represented by the value of the previous period of the series up to p and the shocks up to q the process is called $ARMA(p, q)$. This process is written as

$$y_t = \varepsilon_t + \varphi_1 \cdot y_{t-1} + \cdots + \varphi_p y_{t-p} + \varepsilon_t + \vartheta_1 \cdot \varepsilon_{t-1} + \cdots + \vartheta_q \varepsilon_{t-q}, \quad \varepsilon_t \sim WN(0, \sigma^2)$$

4. Statistical indicators of time series and autocorrelation, evaluation of the autocorrelation functions with sample parameters and parameters for model selection

Let's see the sample $\{y_t\} = \{y_1, y_2, \ldots, y_t,\}$ for evaluation. Sample mean, variation, and covariations are determined as

- *Sample mean*: $\bar{y} = \frac{1}{T} \cdot \sum_{t=1}^{T} y_t$
- *Sample variation*: $S_y^2 = \frac{1}{T} \cdot \sum_{t=1}^{T} (y_t - \bar{y})^2$
- *Sample covariation (τ delay):* $S_{y_t, y_{t-\tau}} = \frac{1}{T} \cdot \sum_{t=1}^{T} (y_t - \bar{y})(y_{t-\tau} - \bar{y})$
- *Correlation coefficient*: $r_{y_t, y_{t-\tau}} = \frac{S_{y_t, y_{t-\tau}}}{S_{y_t} \cdot S_{y_{t-\tau}}}$

The sample correlation coefficient is a random variable that depends on the time delay parameter τ. Forecast testing determines whether there is a correlation between time series delays. It is established that the distribution of the sample correlation coefficient has a normal distribution with parameter $(0, \frac{1}{T})$. The 2σ rule is used to test the forecast.

Time series models are used for forecasting purposes. Therefore, it is necessary to choose a model that minimizes the forecast error. The forecast error is expressed as the sum of the squares of the model residuals. In other words, it is

$$MSE = \frac{\sum_{t=1}^{T} \varepsilon_t^2}{T}$$

If T is high, the MSE is low.

The coefficient of determination by the sum of the squares of the residuals is determined by the formula

$$R^2 = 1 - \frac{\sum_{t=1}^{T} \varepsilon_t^2}{\sum_{t=1}^{T} (y_t - \bar{y})^2}$$

If the sum of squares of the residuals has a low value, then R^2 has a high value. This is because the distribution of R^2depends only on the sample and not on the estimate. An unbiased estimate of the mean of the squared errors is used to calculate the edited R^2. This unbiased evaluation is

$$\widehat{MSE} = \frac{\sum_{t=1}^{T} \varepsilon_t^2}{T-k}$$

Where, k – number of equation parameter, $(T-k)$ – freedom degree

Increasing the number of parameters reduces the estimation error, but doubles the degree of freedom. The more degrees of freedom, the more efficient the model is considered to be. Therefore, it is necessary to develop a model with an intermediate alternative that simultaneously satisfies the two goals of keeping the sum of squared errors as small as possible and the degree of freedom as large as possible. Akaike (AIC) and Schwartz (SIC) information analysts are used to select such a model.
RMSE, or Root Mean Square Error, is also used in model selection:

$$RMSE = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(y_t - \hat{y}\ )^2}$$

$\hat{y}_t - y_t\ time\ series\ forecasting$

Speed of trend functions

Mathematics deals with the growth rate of algebraic functions as the value of the function's argument tends to infinity $(t \to \infty)$. The functions used in trend modeling need to be considered in terms of how they express the economic growth rate and make growth forecasts through it.
The functions are listed in the order of *logarithmic, degree, and exponent functions* from the smallest to the largest according to the rate of growth. The logarithmic function has the slowest increase, while the degree function is the fastest. But in the middle of these there are *linear, quadratic and cubic functions*. When developing a forecast of the future trend of the economy, *pessimistic, optimistic and average scenarios* are made, taking into account the sequence of the growth rate of this function. The trend of macroeconomic indicators is expressed as a time-dependent function $y_t = f(t)$ while the percentage of growth is calculated as

$$g_t = \frac{y_t'}{y_t} \cdot 100\%$$

The following table shows the forms of classical trend functions and growth percentage functions and their general characteristics.

Table 78: Function types and growth rates

Function types	*Function*	*Rate of growth expression*	*Growth Rate Attribute*
Logarithmic function	$y_t = b_0 + b_1 \cdot \ln(t)$	$g_t = \frac{b_1}{t \cdot (b_0 + b_1 \cdot \ln(t))} \cdot 100\%$	Continuously decreasing
Linear function	$y_t = b_0 + b_1 \cdot t$	$g_t = \frac{b_1}{b_0 + b_1 \cdot t} \cdot 100\%$	Continuously decreasing
Quadratic function	$y_t = b_0 + b_1 \cdot t + b_2 \cdot t^2$	$g_t = \frac{b_1 + 2 \cdot b_2 \cdot t}{b_0 + b_1 \cdot t + b_2 \cdot t^2} \cdot 100\%$	Although generally decreasing, it decreases more slowly than a linear function.
Exponential	$y_t = b_0 \cdot e^{b_1 \cdot t}$	$g_t = b_1 \cdot 100\%$	Increases by

function	a constant percentage

RAS methodology for editing technological coefficients of input-output table

At the heart of input-output analysis lies the table of input-output coefficients, delineating the relationship between inputs and outputs within an economy. Crafting an input-output table demands substantial time, effort, and resources. Hence, a primary aim of input-output analysis is to explore its applicability in subsequent economic periods or under altered conditions by refining and enhancing existing input-output tables. Among the myriad methods for editing input-output tables, the RAS method stands out as the most commonly employed in practice. While data stability hinges on both specific spatial and temporal factors, this study focuses solely on temporal stability, with spatial stability requiring the creation of regional input-output tables, a task yet to be undertaken.

To assess the stability of information in the input-output model table, an initial secondary task involves comparing the technological coefficients from prior tables. Information instability is primarily linked to temporal shifts; certain industries may witness rapid changes in technology coefficients, while others may undergo slower transformations. However, all coefficients are expected to undergo some degree of change over the long term. Various factors contribute to these industry-specific alterations, including but not limited to:

1. Introduction of new technologies in an industry alters the production technology of its products.
2. This technological change cascades into adjustments in the production technology of related industries.
3. Introduction of new products prompts changes in production technology, which can be reflected in the input-output table by either adding new rows and columns for the new product as an independent industry or updating existing entries if the new product substitutes an existing one.
4. Changes in input substitution due to price fluctuations are another driver of technological changes.
5. Industries in the input-output table are initially categorized as "pure industries," each associated with the production of a specific product. However, shifts in product dependencies over time may lead to changes in industry classifications and corresponding technology coefficients.
6. Alterations in external conditions affecting imported inputs for domestic production also influence production technology.

Given these factors, the technology coefficient matrix within the economy will naturally undergo some degree of change over time. Therefore, it's crucial to examine the speed, extent, and direction of changes in the input-output model table.

When it's apparent that the information in the input-output table differs from the previous period, corrections should be made and applied to the subsequent period. In our current context, a commonly employed method for processing input-output data is the RAS method.

During RAS method, if the basic period is marked “0”, the correction period is marked “1”, the matric of direct inpur coefficient with n^2 coefficient in an economy with n sectors will be $A(0)$, $A(1)$. When using the RAS method, 3 types of information for the target year (“1”) must be reported in advance:

- Total production X_j

- Total intermediate products sold between industries (total intermediate products of any i industry is marked as $\sum_{j=1}^{n} z_{ij}$ which is equal to the total output of industry i minus the intermediate consumption of industry i (as $X_i = \sum_{j=1}^{n} z_{ij} + Y_i$))
- Intermediate products bought from between industries ($\sum_{i=1}^{n} z_{ij}$)

In the literature of RAS method, intermediate goods sold between i industries or $\sum_{j=1}^{n} z_{ij}$ is marked as U_i, intermediate consumption bought from between j industries or $\sum_{i=1}^{n} z_{ij}$ is usually denoted by V_j. $U = \begin{bmatrix} U_1 \\ \vdots \\ U_n \end{bmatrix}$, $V = \begin{bmatrix} V_1 & \cdots & V_n \end{bmatrix}$ is column and row vectors with n elements. We need these vectors of the target year and they are marked as $U(1)$, $V(1)$.

Main problem of the RAS method: to determine the matrix $A(1)$ by giving three vectors $X(1)$, $U(1)$, $V(1)$ with n element of the target period and $A(0)$ matrix sized $n \times n$. Determined value is marked as $\tilde{A}(1)$. Let's take an example of how to estimate if we have a 3-industry economy.

According to the main procedure conditions, the matrix of direct input coefficients of the base year, the "goal" annual total production, and the sum of the rows and columns of interdisciplinary flows should be given for each industry. Let's mark it as follows.

$$A(0) = \begin{bmatrix} a_{11}(0) & a_{12}(0) & a_{13}(0) \\ a_{21}(0) & a_{22}(0) & a_{23}(0) \\ a_{31}(0) & a_{32}(0) & a_{33}(0) \end{bmatrix} \quad \textbf{(1)}$$

$$X(1) = \begin{bmatrix} X_1(1) \\ X_2(1) \\ X_3(1) \end{bmatrix}, \qquad U(1) = \begin{bmatrix} U_1(1) \\ U_2(1) \\ U_3(1) \end{bmatrix}, \qquad V(1) = \begin{bmatrix} V_1(1) & V_2(1) & V_3(1) \end{bmatrix} \quad \textbf{(2)}$$

First, let's make a hypothesis that $A(0) = A(1)$ or the technological coefficients have not changed during the above period. In order to verify the validity of this hypothesis, it is necessary to analyze the data of products sold and purchased during the above period. Since these are the sum of the rows and columns of the product flow matrix of the input-output table, they can be written directly using the input coefficients as $z_{ij} = a_{ij} X_j$. As by matrix marking it is $A = Z(\hat{X})^{-1}$ then it will be $Z = A\hat{X}$. According to our hypothesis, as input-output flow matrix is $A(0) = A(1)$ then it is possible to mark and use as $A(0)\hat{X}(1)$. Let's write it in detail.

$$A(0)\hat{X}(1)=\begin{bmatrix} a_{11}(0) & a_{12}(0) & a_{13}(0) \\ a_{21}(0) & a_{22}(0) & a_{23}(0) \\ a_{31}(0) & a_{32}(0) & a_{33}(0) \end{bmatrix}\begin{bmatrix} X_1 & 0 & 0 \\ 0 & X_2 & 0 \\ 0 & 0 & X_3 \end{bmatrix}$$
$$=\begin{bmatrix} a_{11}(0)X_1(1) & a_{12}(0)X_2(1) & a_{13}(0)X_3(1) \\ a_{21}(0)X_1(1) & a_{22}(0)X_2(1) & a_{23}(0)X_3(1) \\ a_{31}(0)X_1(1) & a_{32}(0)X_2(1) & a_{33}(0)X_3(1) \end{bmatrix} \quad \textbf{(3)}$$

The reason for the case is whether the sum of the rows and columns of the matrix is consistent with the annual economic goals $U(1)$, $V(1)$. According to matrix nature, if $A(0)\hat{X}(1)$ matrix is multiplied by unit column vector, it will create $\left[A(0)\hat{X}(1)\right]i$ or a column vector representing the row sum and if it is marked as U^1 it will represent U^1 as the estimates of intermediate goods sold between industries under the hypothesis of no technological change.

If $U^1 = U(1)$, then it confirms that $Z(1)$ estimation is true for rows. Therefore, let's determine the sum of column $A(0)\hat{X}(1)$, and if it conforms with $V(1)$. According to matrix nature, if unit column vector is multiplied by $A(0)\hat{X}(1)$ matrix, it will create $i\left[A(0)\hat{X}(1)\right]$ or a row vector representing the sum of the columns and if it is marked as V^1, it represents the intermediate consumption bought interdisciplinary by the industries. So, if $i\left[A(0)\hat{X}(1)\right]=V^1=V(1)$ then it conforms with the annual interdsiciplinary product flow of the goal connected to the old technological matrix $A(0)$, total new production ($X(1)$), therefore, our hypothesis is confirmed.

But in practice, in almost all cases, the hypothesis that technological coefficients will not change is not fulfilled and it will be $U^1 \neq U(1)$ and $V^1 \neq V(1)$. In this case, it is assumed that the row sum of the matrix found in formula 3 is not satisfied. It is expressed as follows.

$$\begin{aligned} a_{11}(0)X_1(1)+a_{12}(0)X_2(1)+a_{13}(0)X_3(1)=U_1^1 \neq U_1(1) \\ a_{21}(0)X_1(1)+a_{22}(0)X_2(1)+a_{23}(0)X_3(1)=U_2^1 \neq U_2(1) \\ a_{31}(0)X_1(1)+a_{32}(0)X_2(1)+a_{33}(0)X_3(1)=U_3^1 \neq U_3(1) \end{aligned} \quad \textbf{(4)}$$

If $U_i^1 > U_i(1)$ then i^{th} row elements of $a_{i1}(0)$, $a_{i2}(0)$, $a_{i3}(0)$ according to our example is higher than them containing the "improved" data of $X_1(1)$, $X_2(1)$, $X_3(1)$. (Likewise, if $U_k^1 < U_k(1)$ then k^{th} row elements of $A(0)$ are lower)

If ratio $U_i(1)/U_i^1$ is marked as r_i^1, then in case of $U_i^1 > U_i(1)$ this ratio is less than 1. If each element of 1st row of $A(0)$ is multiplied by r_1^1, then these elements will reduce from previous value. However, the sum of the elements resulting from multiplying the technological coefficients of this operation by the total production of the industry is equal to the sum of U_1^1.[12] Newly

[12] From Formula 1

$$a_{11}(0)X_1(1)+a_{12}(0)X_2(1)+a_{13}(0)X_3(1)=U_1^1$$

Where, $U_1^1 > U_1(1)$. As $r_1^1 = U_1(1)/U_1^1$

estimated values of 1st row of $A(0)$ are marked as a_{11}^1, a_{12}^1, a_{13}^1 ($r_1^1 a_{11}(0) = a_{11}^1$, $r_1^1 a_{12}(0) = a_{12}^1$, $r_1^1 a_{13}(0) = a_{13}^1$) and the index "1" written in the upper right corner indicates that it is the first calculation made to determine the data for the target year.

Likewise, if there is a case of $U_2^1 < U_2(1)$ for the 2nd industry, then, $r_2^1 = U_2(1)/U_2^1$ is higher than 1. If 2nd row elements of $A(0)$ are multiplied by r_2^1 and the resulted corrected technological coefficient are multiplied by industry production, intermediate product of 2nd industry will derive which equals to $U_2(1)$.[13] The updated elements of 2nd row of $A(0)$ are marked $r_2^1 a_{21}(0) = a_{21}^1$, $r_2^1 a_{22}(0) = a_{22}^1$, $r_2^1 a_{23}(0) = a_{23}^1$ and in this case, all elements of this row will increase. Likewise, elements of the third row also need to be edited and the editing process is the same as in the above two cases.

According to the algebra nature of matrix, we can summarize all these estimations and in order to multiply the first row of $A(0)$ by r_1^1, second row by r_2^1, and third row by r_3^1, the matrix will be written as follows.

$$A^1 = \begin{bmatrix} r_1^1 & 0 & 0 \\ 0 & r_2^1 & 0 \\ 0 & 0 & r_3^1 \end{bmatrix} A(0) \qquad \textbf{(5)}$$

Where, the "1" in the upper right corner of the matrix A^1 represents the first "step" of the RAS procedure. If A^2 then it represents the second step of the estimation (not “A square”). Summarizing formula 5 in matrix notation:

$$A^1 = R^1 A(0)\,. \qquad \textbf{(6)}$$

From here, edited row of $A(0)$ is determined as

$$\left[R^1 A(0)\hat{X}(1)\right]i = \left[A^1 \hat{X}(1)\right]i = Z^1 i = U(1) \qquad \textbf{(7)}$$

and is confirmed to be equal to that of the target year.

The balance above does not mean that the sum of the columns is equal, rather than confirming that the sum of the rows of the target year is equal. Therefore, there is a need to consider whether the column sum of the improved matrix A^1 can be aligned with the target year. So, V_j^1, $V_j(1)$ is compared and edited. The sum of A^1 matrix column is determined as follows.

$$\begin{aligned} &a_{11}^1 X_1(1) + a_{21}^1 X_1(1) + a_{31}^1 X_1(1) = (a_{11}^1 + a_{21}^1 + a_{31}^1) X_1(1) = V_1^1 \\ &a_{12}^1 X_2(1) + a_{22}^1 X_2(1) + a_{32}^1 X_2(1) = (a_{12}^1 + a_{22}^1 + a_{32}^1) X_2(1) = V_2^1 \\ &a_{13}^1 X_3(1) + a_{23}^1 X_3(1) + a_{33}^1 X_3(1) = (a_{13}^1 + a_{23}^1 + a_{33}^1) X_3(1) = V_3^1 \end{aligned} \qquad \textbf{(8)}$$

$$r_1^1 a_{11}(0) X_1(1) + r_1^1 a_{12}(0) X_2(1) + r_1^1 a_{13}(0) X_3(1) = r_1^1 U_1^1 = \left[\frac{U_1(1)}{U_1^1}\right] U_1^1 = U_1(1)\,.$$

[13] Also from formula 1

$$a_{21}(0) X_1(1) + a_{22}(0) X_2(1) + a_{23}(0) X_3(1) = U_2^1$$

Where $U_2^1 < U_2(1)$. As $r_2^1 = U_2(1)/U_2^1$

$$r_2^1 a_{21}(0) X_1(1) + r_2^1 a_{22}(0) X_2(1) + r_2^1 a_{23}(0) X_3(1) = r_2^1 U_2^1 = \left[\frac{U_2(1)}{U_2^1}\right] U_2^1 = U_2(1)\,.$$

Combined, it will be $V(1) = i'\left[A^1 \hat{X}(1)\right]$. If $V_1^1 = V_1(1)$, $V_2^1 = V_2(1)$, $V_3^1 = V_3(1)$ then, the row and column sums will equal to the target year and become $A^1 = \tilde{A}(1)$. If $V^1 = \left[V_1^1 \quad V_2^1 \quad V_3^1\right]$ then, $V^1 = V(1)$ balance will be maintained.

However, in practice, in most cases it is $V^1 \neq V(1)$, therefore, A^1 elements can be edited by columns. If the sum of the first column of formula 8 is $V_1^1 > V_1(1)$ then, it is evident that the sum of first column of A^1 is higher than the first column of the target year, therefore, it is multiplied by ratio $V_1(1)/V_1^1$. This ratio is marked as s_1^1. Edited coefficients of first column are $s_1^1 a_{11}^1$, $s_1^1 a_{21}^1$, $s_1^1 a_{31}^1$ and they are marked as a_{11}^2, a_{21}^2, a_{31}^2. Where, index "2" marked in the upper right corner of a_{i1} indicates that the elements of matrix $A(0)$ are improved for the second time.

Likewise, edited coefficients of second and thirs columnts will be $s_2^1 = V_2(1)/V_2^1$ and $s_3^1 = V_3(1)/V_3^1$. If it is clear that $V_j(1) > V_j^1$ then, $s_j^1 > 1$ and all values of the j^{th} column elements of A^1 multiplied by s_j^1 will increase. On the other hand, if $V_k(1) < V_k^1$ then, $s_k^1 < 1$ and when k^{th} column elements of A^1 are multiplied by s_k^1, all will decrease. If it is evident that $V_m(1) = V_m^1$ then $s_m^1 = 1$ and when m^{th} column elements of A^1 are multiplied by 1, no change will occur.

According to algebra nature of matrix, in order to summarize the estimation to multiply the first column of A^1 by s_1^1, second column by s_2^1, and thrid column by s_3^1, we will multiply matrix A^1 by diagonal matrix of S^1. This represents the second step of improvement towards the target year.

$$A^2 = A^1 \begin{bmatrix} s_1^1 & 0 & 0 \\ 0 & s_2^1 & 0 \\ 0 & 0 & s_3^1 \end{bmatrix} \text{ or } A^2 = A^1 S^1 \qquad \textbf{(9)}$$

From here, we find the sum of edited column:

$$i'\left[A^2 \hat{X}(1)\right] = i'Z^2 = V(1) \qquad \textbf{(10)}$$

which proves that A^1 improvement equals with A^2.

Therefore, we can substitute 6 in formula 9

$$A^2 = R^1 A(0) S^1 \qquad \textbf{(11)}$$

Here, R in the formula represents the diagonal matrix for editing the row elements of matrix A, and S represents the diagonal matrix for editing the column elements. Based on the right-hand side of the formula, this method is called RAS.

Due to the improved column elements in matrix A^2, the row totals provided in matrix A^1 will be different from those of the target year. Therefore, A^2's row totals must be checked for consistency, and the improvement procedure is the same as that for A(0) period row totals. Therefore, we need to determine the $\left[A^2 \hat{X}(1)\right] i$ and it is

$$\begin{bmatrix} a_{11}^2 & a_{12}^2 & a_{13}^2 \\ a_{21}^2 & a_{22}^2 & a_{23}^2 \\ a_{31}^2 & a_{32}^2 & a_{33}^2 \end{bmatrix} \begin{bmatrix} X_1(1) & 0 & 0 \\ 0 & X_2(1) & 0 \\ 0 & 0 & X_3(1) \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} U_1^2 \\ U_2^2 \\ U_3^2 \end{bmatrix} \qquad \textbf{(12)}$$

Where, if mark $U^2 = \begin{bmatrix} U_1^2 \\ U_2^2 \\ U_3^2 \end{bmatrix}$ then, it shows that index "2" is the second estimation of the row sum. If $U^2 \neq U(1)$, then, it will be necessary to edit the row vector into a diagonal form and continue with the step of improving the matrix. If it is converted to the diagonal matrix form of $r_1^2 = U_1(1)/U_1^2$, $r_2^2 = U_2(1)/U_2^2$, it will be

$$R^2 = \begin{bmatrix} r_1^2 & 0 & 0 \\ 0 & r_2^2 & 0 \\ 0 & 0 & r_3^2 \end{bmatrix} = \left[\hat{U}(1)\right](\hat{U}^2)^{-1}. \quad \textbf{(13)}$$

We discussed the improvement procedure in detail during the first row and column improvements. If $R^2 = I$ then, the row and column sum of the elements of matrix A^2 will conform to the target year and it will be possible to use $\tilde{A}(1)$ in $A(1)$ estimation. If not, the $A(0)$ estimation will be continued as follows.

$$A^3 = R^2 A^2 \quad \textbf{(14)}$$

The problem now is to check the consistency of A^3 column sum with the target year. A^3 column sums are marked as V_1^2, V_2^2, V_3^2 and if edit coefficient s_i^2 is converted to the diagonal matrix form $s_1^2 = V_1(1)/V_1^2$, $s_2^2 = V_2(1)/V_2^2$, $s_3^2 = V_3(1)/V_3^2$, it will be

$$S^2 = \begin{bmatrix} s_1^2 & 0 & 0 \\ 0 & s_2^2 & 0 \\ 0 & 0 & s_3^2 \end{bmatrix} = \left[\hat{V}(1)\right](\hat{V}^2)^{-1} \quad \textbf{(15)}$$

From here, $A(0)$ estimation is summarized as follows.

$$A^4 = S^2 A^3 \quad \textbf{(16)}$$

When formula 11 is substituted in 14

$$A^3 = \left[R^2 R^1\right] A(0) \left[S^1\right] \quad \textbf{(17)}$$

and substituted in formula 16

$$A^4 = \left[R^2 R^1\right] A(0) \left[S^1 S^2\right] \quad \textbf{(18)}$$

All marked R^1, R^2, S^1, S^2 are 3×3 sized diagonal matrix. $\left[R^2 R^1\right]$ is the multiplication of 3×3 sized 2 diagonal matrix and it is understood as

$$\left[R^2 R^1\right] = \begin{bmatrix} r_1^2 r_1^1 & 0 & 0 \\ 0 & r_2^2 r_2^1 & 0 \\ 0 & 0 & r_3^2 r_3^1 \end{bmatrix}$$

$\left[S^1 S^2\right]$ can be written likewise. By repeating this procedure, the next improvements can be made. For example:

$$\begin{aligned} A^5 &= \left[R^3 R^2 R^1\right] A(0) \left[S^1 S^2\right] \\ A^6 &= \left[R^3 R^2 R^1\right] A(0) \left[S^1 S^2 S^3\right] \\ &\vdots \\ A^{2n} &= \left[R^n \cdots R^1\right] A(0) \left[S^1 \cdots S^n\right] \end{aligned} \quad \textbf{(19)}$$

This brings out the question - how many times do you make this improvement so that the row and column sums of the edited matrix equal the row and column sums of the target year? The row and column sums of these two matrices will never equal without any difference. Therefore, the improvement continues until it passes with sufficient accuracy (eg 0.001).

In the literatures of RAS method, the intermediary products sold interdisciplinary by i industry or $\sum_{j=1}^{n} z_{ij}$ is marked as U_i, and the intermediary consumption bought interdisciplinary by industry j or $\sum_{i=1}^{n} z_{ij}$ is usually denoted as V_j. $U = \begin{bmatrix} U_1 \\ \vdots \\ U_n \end{bmatrix}$, $V = \begin{bmatrix} V_1 & \cdots & V_n \end{bmatrix}$ are the column and row vectors with element n. We need these vectors of the target year and they are marked as $U(1)$, $V(1)$. Main problem of RAS method: if three vectors $X(1)$, $U(1)$, $V(1)$ with $n \times n$ sized matrix $A(0)$ and with n element of target period are given, then matrix $A(1)$ must be determined. $A(1)$ matrix or the work on establishing the interdisciplinary balance for 2025, 2030, and 2035 based on $A(0)$ or the matrix based on the latest (2019) interdisciplinary balance of Mongolia was made by stepwise approximation method. It is planned to run until the error rate of the result is 100,000 by stepwise approximation method, and the result is satisfied after 22 iterations. The balance between sectors for 2025, 2030 and 2035 is summarized in the following tables in 3 general industries: Agriculture, Manufacturing and Services, and is attached in detail by 19 sectors in the accompanying Excel file of the custom work.

Methodology of final demand impact or multiplier analysis based on input-output table

The utilization of input-output analysis methods for coordinating economic activities is widespread among countries worldwide. These methods are employed to scrutinize macroeconomic structures, internal correlations, development trajectories, and trends. Presently, input-output models have been developed and are in use for macroeconomic research and analysis in approximately 130 countries globally.

Final demand impact analysis

One significant application of input-output model data is estimating the impacts of changes in exogenous factors on the economy. Initially, we explored how alterations in final demand elements affect the overall output of national economic sectors using the inverse Leontief matrix. This was based on short-term assumptions, typically focusing on the next year, where a single or a few influencing factors were considered, such as changes in government demand in the automotive industry or shifts in consumer demand for consumer goods.

On the other hand, if we assume that this change will happen in the long term, we will certainly decide on the basis of preliminary calculations and forecasts. For example, if we want to plan the final demand of the regional economic sectors for 5 years, we will use the inverse Leontief matrix and the future estimate of the total production of all industries required to satisfy this demand. When the long-term planning is made by input-output method, very accurate forecast of final

demand (Y elements) and direct and full cost matrix (A and $[I-A]^{-1}$ elements) estimations are required.

Forecast or effect analysis is made on main interdisciplinary model $X=(I-A)^{-1}Y$ and it is evident that total production (X) is fully dependent on the final demand (Y) and Leontief inverse matrix ($[I-A]^{-1}$). If the final demand vector is forecasted individually or collectively, the inverse Leontiev matrix consists of elements α_{ij}. Therefore, the most important thing is to accurately calculate the value of these elements. While final demand is often forecasted by econometric models, the inverse Leontief matrix depends on the matrix A. We discuss separately in section 2.2 how to change the elements of matrix A. To summarize, final demand is determined by econometric model and used in long-term by "driving" it with input-output model.

The purpose of this section is to estimate the effects of the final demand to the total production forecasted through α_{ij} elements of inverse Leontief matrix. Here, multiplying the inverse Leontiev matrix by the final demand vector yields the total production vector, so it is practically called input-output multiplier analysis.

There are 3 main types of multipliers:

a. ***output multipliers***
b. ***income multipliers***
c. ***employment multipliers***

We discuss it in this sequence on the general interdisciplinary model. Multiplier sign is the ***first*** result of the exogenous (final demand) change and based on the difference of ***total*** results. There are 2 ways to determine the total result. The first is the method of determining by ***direct and indirect*** results, and the second is the method of determining by ***direct, indirect and induced*** results. Multipliers determined by the first method are called ***simple***, and those determined by the second method are called ***total*** multipliers.

If the final demand for a certain product increases, the producer will definitely produce a quantity that is not less than that. This is called the *first result*. A portion of the change in total output due to this demand will be provided by the producer himself, which is called the *direct result*. As a producer increases its production, its intermediate demand will increase, which will condition suppliers to increase their supply, which is called the *indirect result*. As a result of this direct and indirect effect, household income levels in the economy will also increase. With the increase in income, the final product and service will increase in proportion to it, and this will be the *induced result*.

a. Output multipliers

The production multiplier is determined by the production cost of all economic sectors required for 1 MNT of the final demand for products of industry j. If it is estimated from an open interdisciplinary model, it is called a simple production multiplier, and contains both direct and indirect results as described above. Let's continue to explain how to define it on the example from the section one.

$$A=\begin{bmatrix}.15 & .25\\ .20 & .05\end{bmatrix}$$

From here, the inverse Leontiev matrix

$$(I-A)^{-1}=\begin{bmatrix}1.254 & .330\\ .264 & 1.122\end{bmatrix}$$

When total production and final demand changes are marked ΔX and ΔY and if $\Delta Y(1)=\begin{bmatrix}1\\0\end{bmatrix}$ then, it shows that the final demand of only first industry product increased by 1 MNT, if $\Delta Y(2)=\begin{bmatrix}0\\1\end{bmatrix}$ the final demand of only second industry product increased by 1 MNT. Here, the effect of the 1MNT increase of final demand of the first industry product to all economic sectors (to 2 sectors in our example) is $(I-A)^{-1}\Delta Y(1)$. If the total result of these two sectors are marked as , it is

$$\Delta X(1)=\begin{bmatrix}1.254 & .330\\ .264 & 1.122\end{bmatrix}\begin{bmatrix}1\\0\end{bmatrix}=\begin{bmatrix}1.254\\ .264\end{bmatrix}$$

In fact, it is the first column of the inverse Leontiev matrix. If we mark $(I-A)^{-1}$ elements as α_{ij} then it is $\Delta X(1)=\begin{bmatrix}\alpha_{11}\\ \alpha_{21}\end{bmatrix}$.

In order to satisfy the final demand of 1 MNT for the products of the first sector, the first sector needs additional production of 1.254 MNT and the second sector needs additional production of 0.264 MNT. The production multiplier of the first sector will be marked as O_1 and to calculate it, the sum of the elements in column $\Delta X(1)$ or MNT 1.518 is divided by 1MNT. It will be O_1 =1.518₹/1₹=1.518. The 1₹ written on the schedule is the first result of the impact of the final demand of 1 MNT on the first sector. Using the row mark units, the column sum is

$$O_1=i'\Delta X(1)=\sum_{i=1}^{n}\alpha_{i1} \qquad \textbf{(1)}$$

Assuming the simple production multiplier for the second sector same as above:

$$\Delta X(2)=\begin{bmatrix}1.254 & .330\\ .264 & 1.122\end{bmatrix}\begin{bmatrix}0\\1\end{bmatrix}=\begin{bmatrix}.330\\ 1.122\end{bmatrix}=\begin{bmatrix}\alpha_{12}\\ \alpha_{22}\end{bmatrix}$$ or

$$O_2=i'\Delta X(2)=\sum_{i=1}^{n}\alpha_{i2} \qquad \textbf{(2)}$$

From this example, O_2 =1.452. If we write the formula of total simple production multiplier of j sector, it is

$$O_j=\sum_{i=1}^{n}\alpha_{ij} \qquad \textbf{(3)}$$

b. Income multipliers

In practice, two-form income multipliers are estimated and used in research. The first shows how changes in final demand expenditure will affect household income (labor supply) and is called the household income multiplier. Like the output multiplier, there are 3 types: simple, total and cut, depending on the open or closed model estimation. The second refers to the impact of changes in the total cost of production of the industry on household income. As above, there are types I and II, cut type II, depending on which model is estimated.

Household income multiplier or income result. To estimate it, every element of certain column of $[I-A]^{-1}$ or the cost of direct and indirect results of total production is multiplied by the coefficient of direct expenditure of the household. The coefficient of direct expenditure of the household shows the household income per one MNT of the total output of the industry in a closed interdisciplinary model and is expressed by $(n+1)$ row or vector H_R. On our example, these coefficients are the first two elements in the lowest row of matrix $\overline{A}$. If simple household multiplier is marked as H_j the general formula to determine it is as follows.

$$H_j = \sum_{i=1}^{n} a_{n+1,i}\alpha_{ij} \qquad \textbf{(4)}$$

This multiplier is found from $(I-A)^{-1}$ matrix elements and is called “simple” because household economy is given exogenously.

According to our previous example, $a_{n+1,1}=0.3$, $a_{n+1,2}=0.25$. If the vector of the effect of an increase of 1 MNT on the final demand of the first sector on the first and second sectors is marked as $\Delta X(1)$ and its elements are multiplied by $a_{n+1,1}$ and $a_{n+1,2}$, then the formula is as follows.

$$H_1 = \begin{bmatrix} a_{n+1,1} & a_{n+1,2} \end{bmatrix} \Delta X(1) = \begin{bmatrix} a_{n+1,1} & a_{n+1,2} \end{bmatrix} \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \end{bmatrix} = \sum_{i=1}^{n} a_{n+1,i}\alpha_{i1} \quad \text{(n=2)}$$

If we estimate it on the real example and find the answer, it is:

$H_1 = (0.3)(1.254) + (0.25)(0.264) = 0.376 + 0.066 = 0.422$.

The economic meaning of this simple income multiplier is that an increase of 1 MNT in the final demand of the first sector creates a new household income of 0.422 MNT, of which 0.376 MNT is the wages of workers in the first sector and 0.066 MNT is the wages of workers in the second sector.

Likewise, find the direct and indirect household income results of second sector:

$$H_2 = \begin{bmatrix} a_{n+1,1} & a_{n+1,2} \end{bmatrix} \Delta X(2) = \begin{bmatrix} a_{n+1,1} & a_{n+1,2} \end{bmatrix} \begin{bmatrix} \alpha_{21} \\ \alpha_{22} \end{bmatrix} = \sum_{i=1}^{n} a_{n+1,i}\alpha_{i2} \quad \text{(n=2)}$$

$$H_2 = (0.3)(0.330) + (0.25)(1.122) = 0.099 + 0.281 = 0.380$$

It shows that if the final demand of the second sector is increased by 1 MNT, a new household income of 0.380 MNT will be generated, of which 0.099 MNT is the the wages of workers in the first sector, and 0.281 MNT is the the wages of workers in the second sector. This data can be

used for example, by the government: purchase from which industry will increase household income more (efficiency).

c. Employment multipliers

If it is possible to calculate the total production cost of an industry and the number of workers (physical labor) in that industry, then the relationship between them is more accurate to express as employment multiplier than as an income multiplier. For example, in our previous example, total production in closed model is $X_1 = 1000$ MNT, $X_2 = 2000$ MNT, and household is $X_3 = 1000$ MNT. Let's mark the number of workers in industry i as e_i and assume that $e_1 = 3$, $e_2 = 4$. Here, physical labor input coefficient will be $w_{n+1,i} = e_i / X_i$ and by our example, it will be $n = 2$, $w_{31} = 0.003$, $w_{32} = 0.002$. This is the number of workers per 1 MNT of total production.

Generally, if we estimate physical labor inpur coefficient from interdisciplinary model with industry n

$$W_R = \left[w_{n+1,1}, \quad w_{n+1,2}, \quad \cdots, \quad w_{n+1,n} \right]$$

According to our previous example, $z_{31} = 300$ MNT, $z_{32} = 500$ MNT which shows that payment (wage) per worker is 100 MNT and 125 MNT. This allows for a clear study of different price rates in different industries by estimating the physical labor input coefficient.

Employment result or Household employment multiplier. The method of estimating this indicator is generally the same as the estimation of the household income multiplier studied above. The main difference is that instead of employment input coefficient $a_{n+1,i}$ expressed in money, we should write the physical labor input coefficient $w_{n+1,i}$. In other words, instead of vector H_R elements we us vector W_R elements. j industry's simple employment result or simple household employment multiplier is marked as E_j and the formula is as follows.

$$E_j = \sum_{i=1}^{n} w_{n+1,i} \alpha_{ij} \qquad \textbf{(5)}$$

Calculated from the previous example:

$$E_1 = (0.003)(1.254) + (0.002)(0.264) = 0.00429$$

$$E_2 = (0.003)(0.330) + (0.002)(1.122) = 0.00323 .$$

Since these multipliers are represented by very few digits, they can be easily converted without losing their quality. If we multiply the multipliers by 1000, when we interpret the answer, we will say per 1000 MNT, not per 1 MNT of total production. According to our example, the production of 1000 MNT in the first sector requires 4.29 workers, and the production of 1000 MNT in the second sector requires 3.23 workers.

ANNEX 4. METHODOLOGY FOR PROJECTIONS OF POPULATION GROWTH

The cohort-component method, which updates population projections based on the results of the 2020 Population and Housing Census, remains the primary approach for forecasting population growth from 2020 to 2035, consistent with previous NSO methods. This method considers future trends in population components such as births, deaths, and migration, with a focus on the lowest policy impact scenario. By analyzing quantitative birth, death, and migration data, projections are determined based on actual trends.

Like many countries worldwide, Mongolia presents multiple scenarios for births and a single scenario for mortality and migration when forecasting future projections. Given the relatively stable death rate compared to the variability in birth rate, projections for births are developed across three scenarios, while death and migration forecasts are consolidated into one scenario.

The development of population projections accounts for demographic changes observed over the past 10-20 years. Projections are crafted at both national and regional levels, considering total population and those residing within Mongolia's borders. Projections for provinces and the capital city are delineated into five age groups and five-year intervals.

The cohort-component method is esteemed for its capacity to reflect population growth components, including birth, death, and migration, yielding more realistic outcomes compared to purely mathematical methods. This sophisticated approach involves extensive analyses and hypothesizes various scenarios of population growth, birth, death, and migration.

As projections extend over longer periods, they evolve to reflect the dynamic factors influencing population phenomena. Consequently, projections generated through the component method typically span 20-30 years to accommodate realistic forecasting of population processes and changes.

The following information is required for calculation by component method:

1. Base year population by age and gender
2. Birth forecast
3. Death forecast
4. Migration forecast

Population by amount balance: $P_t=P_0+B–D+I–O$ Where,

P_t=> population in t time P_0=> population in 0 period
B => total births from 0 to t period
D => total deaths from 0 to t period
I => total inflow migrants from 0 to t period
O => total outflow migrants from 0 to t period

National revised projections are crafted in three variations to accommodate different birth trends, and in two iterations for the base population utilized in the estimation, totaling six versions. For our survey, we'll exclusively employ the versions pertinent to our needs. Now, let's elaborate on how to leverage this foundational data for projecting population growth.

Base year population: NSO classified the base population in the revised projections for population growth as follows:

1) The population enumerated in the territory of Mongolia at the time of the census includes both the population of Mongolia and foreign citizens and aliens residing on the territory of Mongolia for a period of 6 months or more.
2) The population of Mongolia at the time of the census includes both the population of Mongolia residing on the territory of Mongolia and abroad for a period of 6 months or more.

When forecasting births and deaths, which are the main components affecting the population, a time series is formed based on statistics from the past 20-35 years. Projections are then determined based on the trends observed in these time series.

Birth forecast: Birth forecast is based on Total fertility rate (TFR) and Age-specific fertility rate (ASFR). As outlined in the initial section of the survey, the projection can be carried out using three types of birth forecasts. For the national birth rate forecast, the NSO has devised three scenarios: slow, average, and rapid decline. These scenarios were developed based on three-year average birth rate trends, changes in the structure of women, and the impacts of years with high birth rates.

1. In slow decline birth forecast the birth declines slowly and TFR will be 2.96 in 2050;
2. In average decline birth forecast the birth declines and TFR will be 2.74 in 2050;
3. In rapid decline birth forecast the birth declines and TFR will be 2.51 in 2050;

Death forecast: As a component of population projections, death projections rely on life expectancy at birth. Average life expectancy is calculated using age tables in demographic science, determining the life expectancy of a newborn child as well as that of a person who has reached a certain age. (Countries typically declare the life expectancy of a 0-year-old person in terms of average expectancy.)

A key metric utilized in population projections from age tables is the probability of death within an age group. The probability of death (qx) indicates how many individuals within a population, who have reached a certain age, are expected to die as they transition to the next age group. For instance, the NSO has calculated the probability of death as follows: Death / Life expectancy / Male: 75.0; Death / Life expectancy / Female: 84.0.

Net migration forecast: Migration forecasts are crafted based on foreign migration at the national level and both foreign and domestic migration at the regional, provincial, and capital city levels.

The NSO has devised migration forecasts at the regional, provincial, and capital city levels, considering two scenarios contingent upon the base population used for the projections:

- Only domestic migration is factored into the calculation of the Mongolian population.
- Both foreign and domestic migration are considered in the calculation of the Mongolian population.

Studying administrative migration data from the past 10 years was crucial for developing net migration forecasts. Additionally, foreign migration forecasting relied on data regarding inflows and outflows. Forecasts were based on information from the 2020 Population and Housing Census concerning Mongolian citizens residing abroad and foreign citizens living in Mongolia for 6 months or more. It was assumed that the age and gender structure of these individuals would remain constant.

ANNEX 5. METHODOLOGY FOR CORRELATION ANALYSIS OF GDP PER CAPITA AND FOREIGN MIGRATION OF THE COUNTRIES

- According to ILO data, there is a significant disparity in the scale of human migration across countries. Therefore, it's imperative to account for the fixed effect of each country in our estimation process.
- As the total migration flows of countries in the ILO data vary from year to year, we doubly estimated the effect of the years to accommodate this variability. For instance, we observed a reduction in migration during the COVID-19 pandemic.
- When studying the outflow and inflow of citizens from a country, we employed the following model:

$$Y_{i,t} = a_0 + a_1 X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}. \quad (1)$$

Where, i the country's index; t year; $Y_{i,t}$ dependent variable; $X_{i,t}$ main explanatory variable; η_i the country's fixed effect; η_t annual effect; $\varepsilon_{i,t}$ remaining member.

Data

- Data sourced from the International Labor Organization (ILO) was utilized to compute the number of citizens residing and employed abroad.
- GDP data in the survey was sourced from the World Bank.
- The level of engagement varies across countries in the ILO dataset, and it's important to note that observations for participating countries can be sporadic.
- In this study, we focused on countries comparable to Mongolia within the same region, including those from Asia, the Pacific Ocean, Eastern Europe, and former Soviet Union countries. The evaluations below incorporate a total of 10 to 22 countries, depending on the variables and data available.
- The GDP per capita utilized in the research refers to GDP per capita, PPP (constant 2017 international dollar), as provided by the World Bank.

Main variables

For the dependent variable $Y_{i,t}$ the following four variables are considered:

- Percentage of citizens living abroad: This refers to the share of a country's citizens residing abroad in relation to its total population.
- Outflow: This represents the proportion of citizens who departed the country within a specific year relative to the total population.
- Inflow: This denotes the proportion of citizens who returned to the country within a specific year relative to the total population.
- Net outflow: This is the discrepancy between outflow and inflow for a given year.

Table 79: Number of citizens residing abroad, migration flows, 2000-2022

Variables	Average	Standard deviation	Number of observations
Percentage of citizens residing abroad	2.837%	1.413%	61
Out-migration	1.995%	5.837%	147

Return migration	0.250%	0.231%	37
net migration	0.163%	0.289%	26

Note: This table displays descriptive statistics for countries, each with a frequency of one year, sourced from the ILO.

For main explanatory variable $X_{i,t}$ the following four variables are considered:

i. GDP per capita,
ii. Employment rate,
iii. Last 5 year growth of GDP per capita,
iv. Last 5 year growth of employment rate.

ANNEX 6. METHODOLOGY FOR FORECASTING THE NUMBER OF ENTRANTS AND GRADUATES OF SECONDARY SCHOOLS, TVETS AND UNIVERSITIES

The number of secondary school students aged 6 and older is a pivotal metric for gauging the prospective trajectories of Mongolia's economy and labor force until 2035. To construct the labor force supply forecast, the following data points were leveraged for the time series analysis of entrants and graduates from secondary schools, Technical and Vocational Education and Training (TVET) institutions, polytechnic colleges, and universities up to 2035:

1. **Population**. The analysis focused on the current population aged 6-22 years, with individuals categorized as follows:
   - Ages 6-18 years were considered primary school students.
   - Ages 16-18 years and 19-22 years were identified as vocational school and polytechnic college students, respectively.
   - Ages 18-22 years were classified as university students.

2. **Age-specific transition probability**. This estimation serves as a data quality check by comparing migration probabilities estimated from population differences between two censuses and death data between censuses. Essentially, at the national level, it assesses the natural progression of individuals' ages, assuming no effect from migration movements. For instance, the number of individuals who were 20 years old in 2019 should naturally decrease by a certain amount when they turn 21, with the majority transitioning to age 21.

   In the revised population projection, both gender and 5-year intervals of the population are considered when transitioning to the next age group. This data is then utilized to determine the overall status and the number of students, entrants, and graduates within each 5-year interval.

3. **Secondary school graduates**. Secondary school graduates are segmented into two categories. A portion of students proceed to TVETs upon completing the 9th grade, while the majority continue their education and finish the 12th grade. Consequently, the count of 10th, 11th, and 12th grade graduates is derived by deducting the average progression of 9th graders who transition to TVETs.

Projection sequence:

1. Analyzing the count of students across grades 1 to 12 allows us to project the number of graduates from 2024 to 2035. Anticipating that present 1st-grade students will reach the 12th grade by 2035.
2. The probability of population transitioning between age groups was unavailable on a single-age basis, necessitating separate calculations for males and females. To estimate this, we examined migration probabilities for age ranges 5-9, 10-14, and 15-19.
    - Gender probabilities for males and females were averaged to derive a single probability.
    - Utilizing the geometric mean method, an equal interval per age was calculated for the age intervals of 5-9 years, 10-14 years, and 15-19 years. Based on this estimation, the probability of surviving at ages 5-9 is 0.9991483, at ages 10-14 is 0.998716, and at ages 15-19 is 0.998434.

3. The number of students was calculated based on these probabilities of migration.

4. We estimated the probability of students entering TVETs after completing the 9th and 12th grades, considering that current 1st-grade students will complete 12th grade by 2035.
5. The number of students enrolling in TVETs after a hiatus post high school or after working for a period was estimated using previous year's data on entrants and the ratio of TVET entrants.
6. The number of students entering universities was determined by subtracting those entering TVETs after completing the 9th and 12th grades.
7. We estimated the general dynamics of university entrants until 2035 using the ratio of university entrants to general school graduates.
8. The percentage of average graduates and the total number of university graduates were forecasted based on the dynamics of university graduates since 2002.
9. The number of TVET graduates was estimated similarly, using the average value of 1-year, 1.5-year, and 2-year graduates.

APPENDIX 7. NUMBER OF EMPLOYEES REQUIRED IN 2035, BY 88 SUB-SECTOR CLASSES OF ECONOMIC ACTIVITIES AND MIXED TRENDS OF GDP

№	Sector		Sub- sector	2024	2035	Gap	2024, percentage	2035, percentage
			Total	**1384.3**	**1862.5**	**478.2**	**100.0%**	**100.0%**
S1	Agriculture, forestry, fishing and hunting	DS1	Crop and animal production, hunting and related service activities	316.4	305.6	-10.9	22.9%	16.4%
	Agriculture, forestry, fishing and hunting	DS2	Forestry and logging	2.8	2.7	-0.1	0.2%	0.1%
	Agriculture, forestry, fishing and hunting	DS3	Fishing and aquaculture	0.2	0.2	0.0	0.0%	0.0%
S2	Mining and quarrying	DS4	Mining of coal and lignite	24.8	35.5	10.7	1.8%	1.9%
	Mining and quarrying	DS5	Extraction of crude petroleum and natural gas	1.4	2.0	0.6	0.1%	0.1%
	Mining and quarrying	DS6	Mining of metal ores	28.5	40.7	12.3	2.1%	2.2%
	Mining and quarrying	DS7	Other mining and quarrying	6.5	9.4	2.8	0.5%	0.5%
	Mining and quarrying	DS8	Mining support service activities	8.0	11.4	3.4	0.6%	0.6%
S3	Manufacturing	DS9	Manufacture of food products	22.3	35.0	12.7	1.6%	1.9%
	Manufacturing	DS10	Manufacture of beverages	6.3	9.8	3.6	0.5%	0.5%
	Manufacturing	DS11	Manufacture of tobacco products	0.3	0.5	0.2	0.0%	0.0%
	Manufacturing	DS12	Manufacture of textiles	8.9	14.0	5.1	0.6%	0.8%
	Manufacturing	DS13	Manufacture of wearing apparel	20.2	31.6	11.4	1.5%	1.7%
	Manufacturing	DS14	Manufacture of leather and related products	7.1	11.2	4.1	0.5%	0.6%
	Manufacturing	DS15	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	8.8	13.8	5.0	0.6%	0.7%
	Manufacturing	DS16	Manufacture of paper and paper products	0.7	1.1	0.4	0.1%	0.1%
	Manufacturing	DS17	Printing and reproduction of recorded media	2.3	3.6	1.3	0.2%	0.2%
	Manufacturing	DS18	Manufacture of coke and refined petroleum products	0.6	0.9	0.3	0.0%	0.0%
	Manufacturing	DS19	Manufacture of chemicals and chemical products	0.3	0.4	0.2	0.0%	0.0%
	Manufacturing	DS20	Manufacture of pharmaceuticals, medicinal chemical and botanical products	1.8	2.8	1.0	0.1%	0.1%
	Manufacturing	DS21	Manufacture of rubber and plastics products	2.3	3.6	1.3	0.2%	0.2%

№	Sector		Sub- sector	2024	2035	Gap	2024, percentage	2035, percentage
	Manufacturing	DS22	Manufacture of other non-metallic mineral products	14.0	22.0	8.0	1.0%	1.2%
	Manufacturing	DS23	Manufacture of basic metals	6.7	10.5	3.8	0.5%	0.6%
	Manufacturing	DS24	Manufacture of fabricated metal products, except machinery and equipment	2.3	3.7	1.3	0.2%	0.2%
	Manufacturing	DS25	Manufacture of computer, electronic and optical products	2.2	3.4	1.2	0.2%	0.2%
	Manufacturing	DS26	Manufacture of electrical equipment	0.6	0.9	0.3	0.0%	0.0%
	Manufacturing	DS27	Manufacture of machinery and equipment n.e.c.	0.5	0.7	0.3	0.0%	0.0%
	Manufacturing	DS28	Manufacture of motor vehicles, trailers and semi-trailers	0.2	0.2	0.1	0.0%	0.0%
	Manufacturing	DS29	Manufacture of other transport equipment	0.2	0.2	0.1	0.0%	0.0%
	Manufacturing	DS30	Manufacture of furniture	5.7	8.9	3.2	0.4%	0.5%
	Manufacturing	DS31	Other manufacturing	3.3	5.2	1.9	0.2%	0.3%
	Manufacturing	DS32	Repair and installation of machinery and equipment	4.3	6.7	2.4	0.3%	0.4%
S4	Electricity, gas, steam, air conditioning supply	DS33	Electricity, gas, steam and air conditioning supply	23.8	41.5	17.7	1.7%	2.2%
S5	Water supply; sewerage, waste management and remediation activities	DS34	Water collection, treatment and supply	6.0	6.4	0.4	0.4%	0.3%
	Water supply; sewerage, waste management and remediation activities	DS35	Sewerage	0.2	0.3	0.0	0.0%	0.0%
	Water supply; sewerage, waste management and remediation activities	DS36	Waste collection, treatment and disposal activities; materials recovery	1.7	1.8	0.1	0.1%	0.1%
	Water supply; sewerage, waste management and remediation activities	DS37	Remediation activities and other waste management services	0.7	0.7	0.0	0.0%	0.0%
S6	Construction	DS38	Construction of buildings	65.8	123.5	57.7	4.8%	6.6%
	Construction	DS39	Civil engineering	13.5	25.3	11.8	1.0%	1.4%
	Construction	DS40	Specialized construction activities	20.9	39.2	18.3	1.5%	2.1%
S7	Wholesale and retail trade; repair of motor vehicles and motorcycles	DS41	Wholesale and retail trade and repair of motor vehicles and motorcycles	20.1	26.3	6.1	1.5%	1.4%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	DS42	Wholesale trade, except of motor vehicles and motorcycles	33.0	43.1	10.1	2.4%	2.3%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	DS43	Retail trade, except of motor vehicles and motorcycles	139.9	182.7	42.8	10.1%	9.8%
S8	Transportation and storage	DS44	Land transport and transport via pipelines	56.5	55.0	-1.5	4.1%	3.0%
	Transportation and storage	DS45	Water transport	0.0	0.0	0.0	0.0%	0.0%
	Transportation and storage	DS46	Air transport	5.9	5.8	-0.2	0.4%	0.3%

№	Sector		Sub- sector	2024	2035	Gap	2024, percentage	2035, percentage
	Transportation and storage	DS47	Warehousing and support activities for transportation	7.5	7.3	-0.2	0.5%	0.4%
	Transportation and storage	DS48	Postal and courier activities	1.2	1.2	0.0	0.1%	0.1%
S9	Accomodation and food service activities	DS49	Accommodation	9.0	15.0	6.1	0.6%	0.8%
	Accomodation and food service activities	DS50	Food and beverage service activities	34.1	57.0	23.0	2.5%	3.1%
S10	Information and communication	DS51	Publishing activities	1.1	1.7	0.6	0.1%	0.1%
	Information and communication	DS52	Motion picture, video and television programme production, sound recording and music publishing activities	0.5	0.8	0.3	0.0%	0.0%
	Information and communication	DS53	Programming and broadcasting activities	1.8	2.8	1.0	0.1%	0.1%
	Information and communication	DS54	Telecommunications	15.6	24.5	8.9	1.1%	1.3%
	Information and communication	DS55	Computer programming, consultancy and related activities	0.9	1.4	0.5	0.1%	0.1%
	Information and communication	DS56	Information service activities	0.7	1.1	0.4	0.0%	0.1%
S11	Financial and insurance activities	DS57	Financial service activities, except insurance and pension funding	30.7	66.7	36.0	2.2%	3.6%
	Financial and insurance activities	DS58	Insurance, reinsurance and pension funding, except compulsory social security	1.9	4.1	2.2	0.1%	0.2%
	Financial and insurance activities	DS59	Activities auxiliary to financial service and insurance activities	2.3	5.0	2.7	0.2%	0.3%
S12	Real estate activities	DS60	Real estate activities	2.9	10.2	7.3	0.2%	0.5%
S13	Professional, scientific and technical activities	DS61	Legal and accounting activities	4.0	5.9	1.9	0.3%	0.3%
	Professional, scientific and technical activities	DS62	Activities of head offices; management consultancy activities	0.6	0.9	0.3	0.0%	0.0%
	Professional, scientific and technical activities	DS63	Architectural and engineering activities; technical testing and analysis	3.4	5.1	1.6	0.2%	0.3%
	Professional, scientific and technical activities	DS64	Scientific research and development	3.8	5.6	1.8	0.3%	0.3%
	Professional, scientific and technical activities	DS65	Advertising and market research	0.6	0.8	0.3	0.0%	0.0%
	Professional, scientific and technical activities	DS66	Other professional, scientific and technical activities	2.6	3.8	1.2	0.2%	0.2%
	Professional, scientific and technical activities	DS67	Veterinary activities	2.0	2.9	1.0	0.1%	0.2%
S14	Administrative and support service activities	DS68	Rental and leasing activities	1.7	4.0	2.3	0.1%	0.2%
	Administrative and support service activities	DS69	Employment activities	0.5	1.3	0.7	0.0%	0.1%
	Administrative and support service activities	DS70	Travel agency, tour operator, reservation service and related activities	6.2	14.7	8.5	0.4%	0.8%
	Administrative and support service activities	DS71	Security and investigation activities	7.7	18.1	10.5	0.6%	1.0%
	Administrative and support service activities	DS72	Services to buildings and landscape activities	6.1	14.5	8.4	0.4%	0.8%

№	Sector		Sub- sector	2024	2035	Gap	2024, percentage	2035, percentage
	Administrative and support service activities	DS73	Office administrative, office support and other business support activities	2.2	5.1	3.0	0.2%	0.3%
S15	Public administration and defence; compulsory social insurancy	DS74	Public administration and defence; compulsory social security	103.7	146.9	43.3	7.5%	7.9%
S16	Education services	DS75	Education	121.8	155.5	33.7	8.8%	8.3%
S17	Human health and social work activities	DS76	Human health activities	55.8	64.7	8.9	4.0%	3.5%
	Human health and social work activities	DS77	Residential care activities	2.2	2.5	0.3	0.2%	0.1%
	Human health and social work activities	DS78	Social work activities without accommodation	0.3	0.4	0.1	0.0%	0.0%
S18	Arts, entertainment and recreation	DS79	Creative, arts and entertainment activities	9.1	16.6	7.5	0.7%	0.9%
	Arts, entertainment and recreation	DS80	Libraries, archives, museums and other cultural activities	0.0	0.0	0.0	0.0%	0.0%
	Arts, entertainment and recreation	DS81	Gambling and betting activities	0.2	0.3	0.1	0.0%	0.0%
	Arts, entertainment and recreation	DS82	Sports activities and amusement and recreation activities	6.5	12.0	5.4	0.5%	0.6%
S19	Other service activities	DS83	Activities of membership organizations	9.5	8.7	-0.8	0.7%	0.5%
	Other service activities	DS84	Repair of computers and personal and household goods	4.3	3.9	-0.3	0.3%	0.2%
	Other service activities	DS85	Other personal service activities	16.5	15.1	-1.3	1.2%	0.8%
	Activities of households as employers of domestic	DS86	Activities of households as employers of domestic personnel	1.6	1.5	-0.1	0.1%	0.1%
	Activities of households as employers of domestic	DS87	Undifferentiated goods- and services-producing activities of private households for own use	0.6	0.6	0.0	0.0%	0.0%
	Activities of extraterritorial organizations and bodies	DS88	Activities of extraterritorial organizations and bodies	2.6	2.4	-0.2	0.2%	0.1%

ANNEX 8. PROJECTIONS OF THE DEMAND FOR THE MAIN SPECIALISTS IN ECONOMIC SECTORS UP TO 2030

Agriculture, forestry, fishing and hunting

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Animal husbandry	014	2250-22	Veterinarian, zoologist	As of the end of 2017, there were 988 private veterinary clinics operating in 330 soums. There are 2-3 private veterinary clinics in each soum. On average, 40.000 animals should be imposed per veterinarian, but currently, the number is 170.000 animals. By the end of 2022, 71.1 thousand livestock were counted (NSO). In the academic year 2022-2023, 685 students are majoring in bachelor's courses in animal, and veterinary medicine, 60 students enrolled and 154 students graduated. The number of enrolled students is 2.6 times less than the number of graduates. Industrial revival: technical modernization project for the construction of a complex facility with a meat factory and quarantine zone, 2021-2024, 574 permanent jobs during operation	If 1 veterinarian, zoologist is imposed per 40 thousand animals, we need 1778 specialists. In 2017, there were 66.2 million animals, that is 170,000 animals per veterinarian, so there were 390 veterinarians. It is assumed that the number of animals remains the same. The Livestock Breeding Office of the Department of Food and Agriculture of 21 provinces has 4 positions and requires 84 specialists nationwide. 54 people are working in the Veterinary Office of the capital city, of them 30 are positions that require veterinarians. It can be said that professionals are holding these positions. 114 veterinarians are demanded. Of total, 1292 (1178+114) veterinarians are required but there are 504 vets available. 788 more vets are demanded.	788
Animal husbandry	014	2131-21	Microbiologist	Mongolia consumes an average of 15 million animals for food per year. There is ana ctual problem related to food, including meat and meat product hygiene, and increasing meat export. There are food markets in every capital, provincial center, and large settlement. Intensive animal farming project: Central Region, Tuv Province, 2020-2024, 120 permanent jobs during operation Industrial revival: technical modernization project for the construction of a complex facility with a meat factory and quarantine zone, 2021-2024, 574 permanent jobs during operation	It is necessary to train microbiologists to work in the agricultural industry in order to improve the hygienic conditions of animal products. These people can work in food production and food hygiene control. In order to establish and operate 9 units in the capital and 1 in each province, a total of 30 additional microbiologists are demanded. Industrial revival: 30 additional microbiologists are required as part of the technical modernization project to build a complex facility with a meat factory and a quarantine zone	60
Animal husbandry	014	2131-51	Bacteriologist, virologist		Veterinarians, zoologists, and microbiologists can be professionally trained. It is necessary to qualify people who will work in the field of food production and hygiene	
Animal husbandry	014	2131-30	Parasitologist	The actual problem of food, including meat and meat product hygiene, and increasing meat exports	Veterinarians, zoologists, and microbiologists can be professionally trained	5

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Animal husbandry	014	2131-43	Biotechnologist	**Competitive brand product** 4.5.5.Support nano, **bio and green technology and intellectual product based environmentally friendly organic products,** create favorable investment environment. **Benefits of natural resources** 6.2.1.Establish genetic resources and related traditional knowledge registers, databases, specialized funds, enrich the funds, and **support the development of biotechnology products.** 7.4.22.Introduce methods of analysis in analytical laboratories, **develop** DNA, chemical, physical and **biological laboratories at the international standards,** and establish mitochondrial and bacteriological **analysis laboratories.** 8.3.16. Protect the gene pool of national breeds and strains of animals, produce breeding products, **widely introduce advanced methods of biotechnology in production**, and reduce the economic damage of livestock reproduction. ACTIVITIES TO BE IMPLEMENTED IN 2021-2030 WITHIN "VISION-2050"-THE LONG-TERM DEVELOPMENT POLICY OF MONGOLIA	Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Bio-engineering (078804) Bio-technology (051202) In the academic year 2022-2023, 364 students are studying in undergraduate courses in biology and biochemistry, 89 students enrolled and 46 students graduated. The number of enrolled students is 1.9 times less than the number of graduates. From here, it is impossible to show the profession of bio-technologist separately. In the future, 30 biotechnologists will be required annually, and a total of 360 specialists are demanded over the 12-year period between 2024 and 2035.	360
Animal husbandry	014	3141-11	Technician, bacteriology	Bacteriological technician, biochemical technician and microbiological technician can be trained as one profession	Assuming 3 technicians are needed for each newly trained biotech, then, 1,800 technicians are demanded in total.	1800
Animal husbandry	014	3212-14	Technician, veterinary	Veterinary technicians, artificial insemination technicians, animal vaccinators can be trained as one profession	Assuming that 40.000 animals are imposed to one veterinary technician, then 1778 specialists are demanded in total	1778
Forestry, logging	02	2132-19	Forestry engineer	In the academic year 2022-2023, 168 students studying in the bachelor's course in forestry, 69 students enrolled and 27 students graduated. Also, there are no students in the bachelor's course in the field of fruit and vegetable farming, 10 students enrolled, but no graduators in this field in the current year.	Billion Tree National Movement - Implementation Action Plan Human resource	1423
Forestry, logging	02	3143-11	Technician, forestry		Billion Tree National Movement - Implementation Action Plan Human resource 6426 reforestation gardeners	6426
Forestry, logging	02	9215-11	Forestry officer	Tree planter (9215-12), arborist (9215-12)	Billion Tree National Movement - Implementation Action Plan Human resource 42.6 thousand temporary workers	-
Fishing, breeding	03	2131-19	Fisherman	In the academic year 2022-2023, 2 students studying for a bachelor's course in the field of fisheries and 5 students	It is possible to breed game fish in freshwater lakes (Zavkhan province, Black Lake of Ulaagchi, etc.). In	60

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				for a master's course, no enrollers and graduators in that year.	the future, it is necessary to train 5 specialists every year	
Arable farming	011, 012, 013	2132-12	Agronomist, seed Agronomist, fruit and berries (2132-13) Soil scientist, consultant (2132-15)	Sustainable agriculture 8.3.6. Increase the competitiveness and value of Mongolian crops grown on fertile soil, increase exports, and develop agriculture based on smart technology. ACTIVITIES TO BE IMPLEMENTED IN 2021-2030 WITHIN "VISION-2050"-THE LONG-TERM DEVELOPMENT POLICY OF MONGOLIA In the academic year 2022-2023, 254 students studying for a bachelor's course in the field of grain and animal products, 4 students enrolled and 79 students graduated. 74 students studying for a bachelor's course in agriculture and animal husbandry, 48 students enrolled and 1 student graduated. Also, there are no students in the bachelor's course in the field of fruit and vegetable farming, 10 students enrolled, but no graduators in this field in the current year. According to NSO data, there are 1643 enterprises engaged in arable farming activities. According to the results of the 2021 agricultural cultivation, 824 (679+65+80) agronomists are working in the arable farming.	Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Water resources and irrigation (078808) Planned regional development projects: Irrigated agriculture: Khangai region, Selenge province, 2020-2024, permanent jobs during operation 3375 Greenhouse and warehouse complex: Khangai region, Govi region, Ulaanbaatar city, Umnogobi province, Darkhan-Uul province, 2021-2024, permanent jobs during operation 450 Greenhouse and warehouse complex: Ulaanbaatar city, in the center of 18 provinces, 2021-2024, 450 permanent jobs during operation 19 (5+6+18) agronomists are required for the new project. Assuming that one agronomist will work in each agricultural enterprise, there is a shortage of 819 (1643-824) agronomists	838
Arable farming	011, 012, 013	2133-19	Hydrologist	Sustainable agriculture 8.3.26. Improve the use of agricultural parks, repair and service machinery and equipment, domestically assemble and produce some types of spare parts and equipment, and introduce advanced irrigation techniques and technologies with low water consumption. ACTIVITIES TO BE IMPLEMENTED IN 2021-2030 WITHIN "VISION-2050"-THE LONG-TERM DEVELOPMENT POLICY OF MONGOLIA In our country, 307 engineering irrigation systems are used by citizens, enterprises, and organizations, and about 50-60 irrigation system operation engineers are demanded. In addition, there is a shortage of engineers-hydro-technicians for water construction and construction in 35 companies and 13 design companies engaged in	Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Water resources and irrigation (078808) As of the end of 2019, 54.1 thousand hectares were cultivated with irrigation out of 57.1 thousand hectares that could be used with irrigation. It accounted for 12.5% of the country's total cultivated area. Planned regional development projects: Irrigated agriculture: Khangai region, Selenge province, 2020-2024, permanent jobs during operation 3375	674

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				the construction and construction of irrigation system hydraulics (TRENDS OF IRRIGATED AGRICULTURE DEVELOPMENT: Ministry of Industry and Agriculture doctor, associate professor Sh. Baranchuluun, graduate student H. Kenjegul, School of Engineering of the Agricultural University graduate student B. Amartaivan) According to the results of the 2021 Agricultural cultivation, there are 37 irrigated agriculture agronomists (hydro-technicians) working in the agriculture sector.	Of the 606 irrigated farms, 116 used engineered irrigation equipment, while 490 used conventional irrigation equipment. 105 enterprises said that they did not cultivate irrigated land due to lack of manpower. Assuming that 606 enterprises need one hydraulic technician each, there is a shortage of 569 hydraulic technicians, and if 105 enterprises also have a shortage of hydraulic technicians, a total of 674 hydraulic technicians are demanded.	
Arable farming	011, 012, 013	3141-21	Technical Officer, Botany	According to the labor force survey, 171 technicians and assistant/sub-specialists working in the agriculture sector. This represents 0.1% of the total workforce in the industry. According to the barometric survey, 732 people are working, which is 6% of the employees in the sector.	If we assume that 1643 enterprises in the agricultural sector need one technician each, then 1643 technicians are required	1643
Arable farming	011, 012, 013	8161-11	Operators and assemblers of agricultural machinery and equipment	According to the results of the 2021 Agricultural cultivation, 1,615 (910+705) mechanics, mechanizers, and operators working in the agricultural sector. 37,975 machines and equipment and 5,715 buildings are used in agriculture.	If it is considered necessary to introduce technology and increase productivity in the agricultural sector, the number of machinery and equipment and the number of mechanics and mechanizers should be increased at least twice.	3230

Mining and quarry

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Stone, brown coal extraction	05	2146-15	Engineer, coal	**Industrial revival**: Tavantolgoi and other coalfields full exploitation projects, 2021-2024, permanent jobs during operation: 1449 As of Q3/2023, there are 770,000 registered employees in the country, of which 8% (61,000) employees are working in the mining and extraction industries. Of these, 4,000 are engineers with higher education, and about 4,000 are specialized workers (P. Gankhuu, Erdenes Mongolia) Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Coal Processing Technology (071104)	Of the 1,449 new jobs to be created, 95 engineers are required.	95
Stone, brown coal extraction	05	8111-12	Operator, mine base equipment		The 1,449 new jobs to be created will require 280 mining machinery operators and mechanics.	280

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Crude oil and natural gas extraction	06	2146-18	Engineering, oil and gas extraction	Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Gas engineering (072408)	Mongolia has discovered methane gas reserves in Tavantolgoi deposit. It has not been long since the start of the natural gas extraction project in Gurvantes sum of Umnugobi province. Within the framework of the project, for the first time in Mongolia, the expanded production of coalbed methane gas has been tested.	40
Metal ore extraction	07	2146-11	Engineer, concentrator	In the academic year 2022-2023, 1434 students are studying in the bachelor's course in mining and quarry, 336 students enrolled and 144 students graduated. Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Mining exploitation technology (072401), Mining concentration technology (072401) Objective 4.2. Develop priority economic sectors and create an export-oriented economy. 4.2.14. Put into operation a mining deposit, and built the following high-tech heavy industry complexes: Mining deposits: • Tavantolgoi coal mine; • Oyutolgoi underground mine; • Dornogobi silicon deposit; • Tsagaan Suvarga deposit; • Kharmagtai deposit; • Lithium deposit; • Intensified research and exploration of rare earth elements.	40 more concentration engineers are demanded.	40
Metal ore extraction	07	2113-47	Chemist, rare element, technologist	Objective 4.2. Develop priority economic sectors and create an export-oriented economy. 4.2.14. Put into operation a mining deposit, and built the following high-tech heavy industry complexes: • Lithium deposit; • Intensified research and exploration of rare earth elements.	It is necessary to further train specialists in the field of quarry, enrichment and use of rare earth elements. It is necessary to train 40 chemical technologists.	40
Metal ore extraction	07	2146-12	Engineer, underground mine	Objective 4.2. Develop priority economic sectors and create an export-oriented economy. 4.2.14. Put into operation a mining deposit, and built the following high-tech heavy industry complexes: Mining deposits: • Oyutolgoi underground mine;	It is necessary to train specialists in the field of underground mining engineering. It is necessary to train 40 underground mine operation engineers.	40
Mining	09	2114-11	Geologist	There are 5,711 specialists trained in foreign and domestic	According to MRPAM statistics, Mongolia has more	-

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
support activities				universities in the field of geology. 5,238 of them graduated from Mongolian universities and 473 from foreign universities. 3631 geological exploration, 390 hydrogeology, 705 geophysics, 210 engineering geology, geo-ecology, geotechnics, 214 geological and mineral resources management, and 561 drilling technology specialists were trained. Out of 3,631 geologists, there are currently 3,208 geologists, and there are about 2,500 geologists who can work before the retirement age (Kh. Ulambadrakh, a teacher of the Department of Geology and Geophysics of NUM, Department of Human Resources, geologists' intellectual value). Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated March 29, 2023) Geology (053204) Objective 4.2. Develop priority economic sectors and create an export-oriented economy. 4.2.14. Put into operation a mining deposit, and built the following high-tech heavy industry complexes: Mining deposits: • Tavantolgoi coal mine; • Oyutolgoi underground mine; • Dornogobi silicon deposit; • Tsagaan Suvarga deposit; • Kharmagtai deposit; • Lithium deposit; • Intensified research and exploration of rare earth elements. ACTIVITIES TO BE IMPLEMENTED IN 2021-2030 WITHIN "VISION-2050"-THE LONG-TERM DEVELOPMENT POLICY OF MONGOLIA	than 3 million tons of rare earth element resource. It is being carried out in the framework of the projects of rare earth deposit license-holder companies of our country as well the countries that are interested in Mongolia's rare earth reserves. In the future, there is a need to coordinate research activities, concentrate labor force and funds, and cooperate. Every year, the number of exploration licenses decreases and is currently 2 times less than the number of exploitation licenses. Compared to 2011, exploration licenses decreased by 2.8 times, and investment in exploration decreased by 3.4 times. Therefore, in order to intensify the industry activities and create favorable conditions for attracting domestic and foreign investments, the Ministry of Mining and Heavy Industry has fully digitized the process of issuing licenses for mineral exploration through selection, and is preparing to increase the number of licenses for exploration by 3-4 times. It will enable increase in the mineral resources and discover more large deposits that will affect the country's economy. About 100 exploration licenses are issued, which means 300-400 per year. Legal framework of the geological industry of Mongolia is not clear, no information and exploration areas that are attractive to investors, number of exploration licenses is decreasing every year. The industry accept that non-professional work has increased due to job demand. The number of students has also decreased significantly. A total of 101 students are studying in the geology and geophysics department of NUM, and less than 80 students are studying in the 4 geology departments of MUST. According to the indicators of the last 15 years, the number of specialists trained in the field of geology has decreased by three times. However, judging by the number of available geologists today, it is seen that there is no need to train more than the current number.	

Manufacturing

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Food production	10-11	2145-24	Technologist, food, beverage	Industrial revival: "Technical modernization project for the construction of a complex facility with a meat factory and quarantine zone", Sukhbaatar, Bayankhongor, Arkhangai, Khovd, Darkhan-Uul province, 2021-2024, 574 jobs In the past 10 years, the share of food production in the processing industry in Mongolia has increased fourfold, and domestic production has increased 1.5 times. The food industry is lacking in technology. For example, there is a shortage of 20% of engineering and technology workers, 30% of technical workers, and 60% of equipment engineers (report by T. Jambaltseren, State Secretary of the MFALI). In the academic year 2022-2023, 921 students studying in the bachelor's course in food and production processing, 215 students enrolled and 209 students graduated.	Industrial revival: "Technical modernization project for the construction of a complex facility with a meat factory and quarantine zone", Sukhbaatar, Bayankhongor, Arkhangai, Khovd, Darkhan-Uul province, 2021-2024, 574 jobs Since there is a 20% shortage of food industry engineers and technologists, if the number of graduates is increased by 20% every year, it is necessary to train 42 technological engineers annually and 294 specialists from 2024 to 2030. According to NSO data, 2123 enterprises are operating in the field of food production. Assuming that 1-2 food technologists work in one enterprise, 3185 technologists are needed. Assuming that there is a shortage of technologists in 20% of them, it is necessary to train 634 new food technologists.	634
Food production	10-11	2141-13	Engineer, machinery, equipment		There is a 60% shortage of engineers of food industry equipment. According to NSO data, 2123 enterprises are operating in the field of food production. Assuming that 1-2 equipment engineers work in one enterprise, 3185 engineers are required. Assuming that 60% of them lack engineers, it is necessary to train 1910 new engineers.	1910
Food production	10-11	8160-11	Operator, bakery processing machinery		There is a 30% shortage of food industry technicians. According to NSO data, 2123 enterprises are operating in the field of food production. Assuming that 3-4 equipment engineers will work in one enterprise, 7341 technicians are required. Assuming that 20% of them lack technical staff, it is necessary to train 2229 new technical staff.	2229
Textile	13	2141-20	Engineer, sewing, knitting, spinning and textile equipment	In the field of cashmere processing, there are 15 deep processing plants, 23 primary processing plants, 59 small and medium knitting plants, and 150-200 small household workshops (MOFALI). In the field of wool processing, there are 2 carpet	Assuming that 97 factories in the cashmere processing industry require one engineer each, 97 engineers (for sewing, knitting, spinning and textile equipment) are demanded. Assuming that 141 non-felting factories and	240

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				factories, 4 weaving factories, 9 spinning factories, 1 nonwovens production factory, 28 washing factories, 23 hair sorting factories, 56 knitting factories, 16 felt goods production factories, 1 wool fertilizer production factory, 120 felting industry, a total of 261 factories, Research Institute (Light Industry Research and Development Institute) - 1, Research and Development Center (Food, Agriculture and Light Industry Research and Development Center) - 1 operating (MOFALI).	Research Institutes and Research Development Centers each need one knitting, spinning, and textile equipment engineer, a total of 143 engineers (sewing, knitting, spinning, and textile equipment) are demanded	
Textile	13	2141-38	Technologist, knitting		Assuming that 1-2 technologists are required for each of the 97 cashmere processing plants, 146 additional technologists are demanded. Assuming that 1 technologist is required for each of 141 non-felting factories and 3 technologists each for Research Institute and Research and Development Center, a total of 147 textile technologists need to be trained	293
Clothing	14	2141-20	Engineer, sewing, knitting, spinning and textile equipment	According to NSO data, 573 enterprises are operating in the field of clothing production.	Assuming that 5% of enterprises need equipment engineers, 57 engineers are demanded.	29
Clothing	14	2141-44	Technologist, sewing		Assuming that 10% of enterprises need technologists, 57 sewing technologists are demanded.	57
Clothing	14	7531-14	Designer, tailor, sewer	Since the late 1990s, export-oriented garment industries with domestic and foreign investment have been developing rapidly, taking advantage of the favorable conditions of the quota system and preferential conditions granted by the United States to Mongolia. At one time, this sector employed more than 30,000 people and alone accounted for 29% of the total exports. For countries that were exporting to countries such as China, Hong Kong, and South Korea, and were looking for additional market space, Mongolia was definitely a very favorable country for manufacturing, with the opportunity to export sewn and knitted products to the United States without any quota restrictions. However, in January 2005, when the quota system was invalidated, many domestic and foreign-invested factories were closed, and the industry was in a	Today there are about 2,500 people in the garment industry, which is a very small number. As for the domestic market, there are about 550,000 children's uniforms in schools. There is also a market for 26,000 uniforms for employees. According to the Ministry of Finance, in 2016, 25 billion 640 million MNT was budgeted for the purchase of standard clothes, accessories and soft goods. About 69,900 workers in the mining and processing industries are provided with PPE clothing. Other than its fabrics, it can be produced and supplied locally. When it comes to working clothes and uniforms, there is an opportunity to spend about 70 billion MNT on domestic purchases. If it is assumed that one more knitter needs to be trained for each garment industry enterprise, 573	573

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				difficult situation. A small number of sewing factories have not stopped their activities, and have continued their work in the domestic market, especially in the production of custom products such as work, labor protection uniforms (https://ikon.mn/n/f6i).	knitters are required	
Clothing	14	7533-11	Sewer, soft goods		At least 2,500 more tailors need to be trained in the garment industry.	2500
Clothing	14	2163-11	Designer, clothes	In the academic year 2022-2023, 2216 students are studying in fashion, interior and industrial design bachelor courses, 280 students enrolled and 258 students graduated.	Fashion specialists are enough in number.	-
Leather industry	15	2141-21	Engineer, sheepskin, leather and fur equipment	Industrial revival: "Darkhan leather complex production and technology park", Darkhan-Uul province, 2020-2024, 2400 jobs during operation Currently, 34 leather processing factories are operating in Ulaanbaatar and Darkhan. At the same time, more than 100 small and medium-sized enterprises producing leather products are working in the capital and provinces. In the field of leather processing industry, there are 14 leather semi-processing plants, 4 deep processing dry workshops, 12 small deep processing plants, 10 large deep processing plants, 6 enterprises for washing wool and cashmere, Pre-cleaning facilities, Light industry research and testing Production Armono Corporation is operating as a manufacturing plant (MOFALI).	Assuming that 34 tanneries require 1-2 engineers each, 51 tannery equipment engineers need to be trained.	51
Leather industry	15	2141-40	Technologist, leather	As of 2019, 7,469.2 thousand pieces of leather were processed, 82% of which were semi-processed and 18% were deep-processed. By increasing the production capacity, the goal is to process 15 million leathers per year. The goal is to double the processing of leather.	Assuming that 34 tanneries require 1-2 engineers each, 51 tannery equipment engineers need to be trained.	51
Wooden products	16	2141-37	Technologist, wood	There are 110 enterprises in the production of lumber and cut materials, 24 in construction wood products, 70 in panel furniture, 12 in soft furniture, 50 in home wood, 6 in musical instruments, 16 in briquettes, and more than 180 in the production of small carpentry and providing employment to more than 6000 people. About 90% of the currently operating factories and enterprises are micro-enterprises with 5-10 employees, and there are	Assuming that 50 enterprises with 30-300 employees need one technologist each, 50 technologists are demanded.	50

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				about 50 large enterprises with 30 to 300 employees (MOFALI). In the 2022-2023 academic year, 77 students studying in the bachelor's course in materials processing and materials science, 13 students enrolled, and 14 students graduated.		
Printing	18	2141-41	Technologist, printing	More than 300 printing houses are operating in Ulaanbaatar, providing jobs to about 4,000 people. 203 (70%) of all printing houses are working in the field of designing, small number reproduction, and small production services of printing souvenirs. On the other hand, 70 medium-sized factories (24%) are offset, silk-screen printing, and the remaining 17 large factories (6%) are houses with high-tech one or more color printing machines and multi-functional equipment that can receive large orders. (MOFALI).	Assuming that 77 medium and large factories require one press technologist each, 77 press technologists are demanded	77
Printing	18	2141-39	Technologist, packaging	More than 50 enterprises active in the field of containers and packaging across Mongolia provide jobs to more than 2,000 people and produce a variety of synthetic bags, plastic food containers, corks, various cloth and paper bags, cloth bags, nets, heavy-duty and non-carrying bags, single-use cutlery, canisters for liquid products, and all kinds of labels are produced and sold domestically worth more than 170 billion MNT annually (MOFALI).	Assuming that each company needs 50 technologists, it is necessary to train 50 packaging technologists.	50
Oil processing	19	3134-12	Operator, distillation apparatus	"VISION - 2050" Mongolia's long-term development policy (Parliament Resolution No. 52 of 2020), 2021-2030, 4.5.14 of the activities planned to build the following heavy industry complexes: - Petrochemical, coke-chemical, metallurgical industries; - Coal washing plant; - Coal-chemical, coal-energy, methane gas production, technology park; 645 new jobs to be created at the Oil Refinery Mongolia and Oil Refinery Plant State-owned LLC	MMHI	54
Oil processing	19	3116-12	Laboratory worker, chemical processing		MMHI	50
Oil processing	19	3133-11	Operator, chemical heat treatment equipment		MMHI	24

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Oil processing	19	2145-12	Engineer, oil, fuel technologist		MMHI	20
Chemical production	20	2145-22	Technologist, chemical processing	About 40 companies producing cosmetic products are operating in Mongolia, and more than 10 enterprises, individuals and research teams that produce beauty, skin and hair care products with natural organic plant ingredients of about 10 types of plant raw materials (MFALI).	Assuming that each of the 40 companies requires a technologist, 40 tanks of chemical processing technologists are demanded.	40
Pharmaceutical production	21	2262-12	Pharmacist	There are 43 pharmaceutical factories in Mongolia (MoH).	Assuming that each pharmaceutical factory needs one pharmaceutical chemist and one pharmaceutical factory pharmacist, so they need 43 more pharmacists.	43
Production of rubber and plastic products	22	2145-23	Technologist, plastic	According to NSO, as of Q3/2023, 11 entities produce rubber products and 154 entities produce plastic products .	Considering that 1/3 of the total 165 factories of rubber and plastic products require technologists, so they need 55 more technologists.	55
Production of glass and building materials	23	2141-43	Technologist, glass	Bagakhangai glass and glass products production, industry and technology park	The packaging glass plant will produce 68.8 tons of products per day 30% of the glass waste coming out of Ulaanbaatar will be recycled and produced. It has a total of three industrial zones, and the packaging glass factory will generate an average of 48 billion MNT in annual sales, pay an average of 10 billion MNT in taxes to the state and local budgets, and create more than 380 new jobs. The park needs 15 technologists	15
Production of glass and building materials	23	2142-46	Technologist, building material	Nalaikh building materials industry and technology park Zuunmod Development Park (light, food, construction) As of December 4, 2023, there are 280 enterprises that have license for production of construction materials (MCUD). **From the license requirements**: In addition to having a technology-engineer with a qualification of building materials and a consultant's degree suitable for the industrial category, a labor protection engineer will be employed. For small and medium-sized enterprises, the above engineers and technicians may be employed on a contract basis.	Labor force demanded in near future: construction materials industry ITA 6886 (Current situation, challenges and solutions of the building materials industry, 2022). The above estimate is too high and likely to be duplicated, so the demand has been reduced. If it is considered necessary to add one technologist engineer for each of 280 licensed enterprises, it is necessary to train 280 more technologist engineers.	280
Production of glass and building	23	8114	Cement, other mineral manufacturing	**From the license requirements:** workers with qualifications related in industrial equipment and technology, and at least 60% with professional	Labor force demanded in near future: Equipment operator 20892 (Current situation, challenges and solutions of the building materials industry, 2022)	2061

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
materials			equipment operator	training	Taking into account the needs of Nalaikh construction material industry and technology park, newly established Khovd cement factory and other large factories, it is estimated that about 4000 new jobs will be created, 60% of which will be 2400 skilled workers. It is distributed according to the structure of skilled workers, which is calculated according to the needs of the labor force required in the near future. 85.9% of 24,333 skilled workers are equipment operators.	
Production of glass and building materials	23	7233-18	Mechanic, industrial machinery, equipment		Labor force demanded in near future: Equipment mechanic 1721 (Current situation, challenges and solutions of the building materials industry, 2022)	170
Production of glass and building materials	23	7411-11	Electrician		Labor force demanded in near future: Equipment electrician 1229 (Current situation, challenges and solutions of the building materials industry, 2022)	121
Production of glass and building materials	23	7112-18	Layer, furnace		Labor force demanded in near future: Heat treatment furnace liner 491 (Current situation, challenges and solutions of the building materials industry, 2022)	48
Production of glass and building materials	23	3116-12	Laboratory worker, chemical processing	**From the license requirements:** Large enterprises will have their own laboratory to determine the quality of their main and auxiliary raw materials, materials, and products, and for small and medium-sized enterprises, they will work with an accredited laboratory to determine the quality	Labor force demanded in near future: Laboratory worker 246 (Current situation, challenges and solutions of the building materials industry, 2022) 40% of 280 entities with licenses are big companies, if they consider it necessary to have their own laboratory, 112 new laboratory assistants are demanded.	112
Metal processing industry	24	2146-28	Metallurgist, radioactive minerals	"VISION - 2050" Mongolia's long-term development policy (Parliament Resolution No. 52 of 2020), 4.5.14 of the activities to be implemented in 2021-2030 states that the following heavy industry complexes will be built: - Copper concentrate processing plant; - Steel industry; - Spar concentrator; - Gold refinery. According to the Government action plan for 2020-2024 the following works will be started: - An iron metallurgical plant in one of Darkhan-Uul,	Mongolian steel - 1 complex /Darkhan iron and steel plant JSC/: 1915 new jobs Erdenet Metallurgical Plant /Beren Group LLC/: 1095 new jobs Altanshiret Industrial Park /Bold Tumur Yeruu Gol LLC/: 500 new jobs Copper concentrate processing plant /Erdenet plant SOE/: 853 new jobs Cathode copper production plant from oxidized ore /Erdenet plant SOE/: 287 new jobs The project to establish a copper concentrate processing plant / based on the Oyutolgoi deposit/:	70

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				Orkhon, and Dornogobi provinces; - Copper pyro and hydrometallurgical plants to be established on the basis of SOE "Erdenet Industry"; - Precious metal refining plant; - The construction of a copper concentrate processing plant based on the Oyutolgoi deposit (MMHI, Department of Heavy Industry Policy).	960 new jobs	
Metal processing industry	24	1322-11	Chairman, master /manager/, agency, department, unit, workshop, shift /open pit, underground mine/			60
Metal processing industry	24	3117-19	Technician, metallurgy			58
Metal processing industry	24	2113-27	Chemist, metallurgy			54
Metal processing industry	24	2151-15	Engineer, electrical mechanical equipment			46
Metal processing industry	24	2143-12	Engineer, inspection			46
Metal processing industry	24	2141-17	Engineer, technical repairs			39
Metal processing industry	24	2146-24	Technologist, melting			37
Metal processing industry	24	2146-35	Engineer, metal preparation area			36
Metal processing industry	24	3133-12	Operator, chemical water filtration, purification, distillation, equipment			35
Metal processing industry	24	3122-12	Field coordinator			33
Metal	24	3122-11	Factory inspector			33

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
processing industry						
Metal processing industry	24	3119-11	Technician, safety			33
Metal processing industry	24	3116-16	Chemical Engineering Technician			30
Metal processing industry	24	2146-36	Metallurgical engineering, casting			30
Metal processing industry	24	2146-25	Technologist, casting			30
Metal processing industry	24	2146-17	Engineer, open-pit mining			30
Metal processing industry	24	2141-11	Engineer, industry			30
Metal processing industry	24	3119-11	Technician, safety		Homeland Security Shift Supervisor	30
Metal processing industry	24	3117-15	Sampler, metallurgical plant			28
Metal processing industry	24	2146-11	Engineer, concentration			26
Metal processing industry	24	2142-44	Engineer, treatment plant			25
Metal processing industry	24	3117-21	Metallurgical plant foreman, roll worker and other workers			24
Metal processing industry	24	2141-26	Engineer, electrical automation			23
Metal processing industry	24	2141-25	Engineer, labor safety			21

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Metal processing industry	24	2142-16	Engineer, civil construction			21
Metal processing industry	24	2146-31	Engineer, metallurgical, control and testing			20
Metal processing industry	24	2146-16	Engineer, metallurgical ores			20
Metal processing industry	24	2144-38	Mechanical engineer, industrial machine equipment			20
Metal processing industry	24	3135-12	Operator, metal melting furnace			20
Metal processing industry	24	8122-11	Furnace Operator, Metal Melting			48
Metal processing industry	24	8122-22	Operator, stretching machine			40
Metal processing industry	24	7213-12	Thin metal worker, boiler stove			40
Metal processing industry	24	7124-14	Insulation worker, boiler and pipe			34
Metal processing industry	24	8111-11	Operator, rig			15
Metal processing industry	24	8112-11	Operator, tungsten, copper float equipment			15
Metal processing industry	24	7412-12	Electrical mechanic			30
Metal processing industry	24	8121-22	Operator, metal, heat treatment machine			30
Metal processing	24	8112-15	Operator of ore crushing,			25

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
industry			processing, milling and washing machines			
Metal processing industry	24	7212-24	Welder, spotter			25
Metal processing industry	24	7212-11	Staff, metal heating and melting furnace			25
Metal processing industry	24	8121-13	Furnace operator, steel processing /oxygen furnace/			25
Metal processing industry	24	7233-19	Mechanic, ventilation and air exchange equipment			25
Metal processing industry	24	8111-29	Pumpman, pump repairman			25
Metal processing industry	24	8111-15	Operator, floating concentration			25
Metal processing industry	24	7212-13	Worker, metal heating and melting furnace /gas/			25
Metal processing industry	24	7212-12	Worker, metal heating furnace /induction/			25
Metal processing industry	24	7413-12	Cable worker, telecommunication, electric power underground cable			25
Metal processing industry	24	7212-22	Welder, /semi-automatic welding/			25
Metal processing industry	24	7212-14	Welder			20
Metal processing industry	24	8121-23	Operator, sheet metal forming machine			20

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Metal processing industry	24	8121-11	Furnace Operator, Steel Processing			20
Metal processing industry	24	7233-26	Adjusters, industrial machinery and equipment			20
Metal processing industry	24	7233-15	Mechanic, basic machinery and equipment			20
Metal processing industry	24	7413-14	Connecting cable			20
Metal processing industry	24	8122-20	Operator, base machine for finished metal processing products			20
Metal processing industry	24	8111-31	Mechanic, engine			20
Metal processing industry	24	7233-15	Mechanic, basic machinery and equipment			20
Metal processing industry	24	7223-20	Operator, lathe base machine /turner/			20
Metal processing industry	24	7223-18	Operator, driller base machine			20
Metal processing industry	24	7223-16	Operator, machinery equipment			20
Metal processing industry	25			According to NSO statistics, 226 entities are operating in metal product manufacturing as of Q3/2023.		-
Production of computer, electronic and optical products	26			According to NSO statistics, 9 entities are operating in Computer, electronic and optic production as of Q3/2023.		-
Production of electrical equipment	27			According to NSO statistics, 24 entities are operating in Electric equipment manufacturing as of Q3/2023.		-

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Production of machinery and equipment	28			According to NSO statistics, 19 entities are operating in Machinery equipment manufacturing as of Q3/2023.		-
Vehicle production	29			According to NSO statistics, 5 entities are operating in Vehicle manufacturing as of Q3/2023.		
Production of other vehicle equipment	30			According to NSO statistics, 5 entities are operating in other vehicle equipment manufacturing as of Q3/2023.		-
Furniture	31	3432-18	Designer, furniture	According to NSO statistics, 369 entities are operating in Furniture manufacturing as of Q3/2023. 38 insured persons in the profession of interior designer and decorator (3432) paid social security deductions. According to the labor force survey, there were 1,077 people working in 2020, of which 420 were paid full-time workers, 335 were paid temporary workers, and 323 were unpaid market-oriented household workers. But it probably includes all kinds of designers and decorators	If consider that 30% of the 369 entities require furniture designers, then 111 furniture designers are demanded.	111
Other manufacturing	32	2163-13	Designer, product	According to NSO statistics, 80 entities are operating in other manufacturing as of Q3/2023. In the academic year 2022-2023, 2216 students studying in fashion, interior and industrial design bachelor courses, 280 students enrolled and 258 students graduated.	The number of product and production designers and technologists should be increased in order to increase the competitiveness of the sales of manufacturing products and to improve the technology. 100 new designers are in demand	100
Assembly, installation and related maintenance of machinery and equipment	32			According to NSO statistics, 240 entities are operating in Assembly, installation and related maintenance of machinery and equipment as of Q3/2023.	In order to increase the productivity of the manufacturing industry, it is necessary to carry out technical and technological innovations, support investment in production equipment, and train operators, assemblers and repairmen. 33.3% of workers in South Korea's processing industry are machinery and equipment operators and assemblers. In Mongolia, 11.9% or 13,383 people work in the processing industry. The number of machinery and equipment operators and assemblers should be increased 30% (17,398)	4015

Electricity, gas, steam, ventilation

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Electricity generation, transmission and distribution	351	2151-11	Engineer, electrical	Erdeneburen HPP project The project to increase the installed capacity of TPP-3 SPP by 75 mW Tavantolgoi thermal power plant project 300 MW CC Project of Buuruljuut Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant Choibalsan TPP installed capacity expansion project by 50 MW Baganuur Thermal Power Plant Project (MoE) 300MW CS Project of Buuruljuut: supplied to the power system of the Central region, 250 jobs will be added to the power plant, 350 to the mine, for a total of 600 people. https://www.e-invest.mn/project/69/	**Erdeneburen HPP:** ETS - 22 **Tavantolgoi thermal power plant project:** Executive Director 1, Deputy Director, Chief Engineer 1, Consultant 2, Head of Production and Technical Department 1, Chief Engineer, Calculation Engineer 2, Shift Engineers 5, Head of Electricity and DNA 1, Operation Engineer 4 (2+2) **Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant:** Plant shift engineer 1 **Choibalsan TPP installed capacity expansion project by 50 MW:** Director 1, Deputy director 1, ETS 29 **300 MW CC Project of Buuruljuut TPP:** ETS 50	121
	351	2151-20	Engineer-technologist, electrical		The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW: electrical expert 6	6
	351	2145-12	Engineer, oil and fuel technologist		The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW: fuel specialist 5	5
	351	2145-13	Engineer, chemical		**The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Chemical specialist 3 **Tavantolgoi thermal power plant project:** Chemical engineer 1	4
	351	3116-12	Laboratory assistant, chemical processing		**Tavantolgoi thermal power plant project:** Chemical control technician 2, Laboratory assistant 4 **Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant:** Water preparation laboratory assistant 2, Fuel laboratory assistant 3, Sample preparer 3 **Choibalsan TPP installed capacity expansion project by 50 MW:** Chemical assistant 4	18
	351	2141-17	Engineer, technical maintenance		**The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** mechanic workshop worker 2 **Tavantolgoi thermal power plant project:** Mechanic engineer 2	10

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
					Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant: Head of Operation Department 1, Head of Maintenance Department 1, Turbine Operation Engineer 1, Turbine Repair Engineer 1, Head of Turbine Workshop 1, Heavy Machinery Mechanical Engineer 1	
	351	2141-12	Engineer, facility		**The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Turbine adjustment specialist 4 Stove operation specialist 10 Turbine Operations Specialist 6 **Tavantolgoi thermal power plant project:** Water supply and cooling system engineer 2 **Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant:** regime calculation engineer 1	23
	351	2522-17	Engineer, computer system		**The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW**: DHA software specialist 4 **Tavantolgoi thermal power plant project**: Computer engineer 2	6
	351	7412-12	Electric mechanic		**Erdeneburen HPP:** Mechanic maintenance, electric maintenance - 17 **Tavantolgoi thermal power plant project:** Head of maintenance unit 1, repairman 18 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Repair master of electricity and electrical equipment 1, Head of electricity and electrical equipment workshop 1, Shift manager of electricity and electrical equipment workshop 4, Repairman of electrical equipment 2, Relay, protection and automation repairman 4, Electrical equipment repairman 4 **Choibalsan TPP installed capacity expansion project by 50 MW:** Electrician 5 Buuruljuut 300 MW TPP project: Mechanic maintenance, electric maintenance 120	177
	351	7212-14	Welder		**Tavantolgoi thermal power plant project**: Welder 4	4
	351	8111-28	Stove machinist, repairman		**Tavantolgoi thermal power plant project**: Stove machinist 12, Stove machinist assistant 12, Head of the furnace fuel transfer workshop 1 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Stove Operation	32

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
					Master 1, Stove Repair Master 1, Stove Repairers 5	
	351	8182-14	Operator, thermal plant		**Tavantolgoi thermal power plant project:** Fuel Line operator 12, Turbine Workshop Supervisor 1, Turbine operator 12, Turbine Assistant operator 12, Deara tor, Feed Water operator 12 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Turbine Operation Master 1, Turbine Repair Master 1, Turbine Workshop Shift Leader 4, Turbine Machinist 12, Turbine Auxiliary Equipment Machinist 12, Turbine Repairman 8, Fuel Transfer Machinist 2, Operator 2, Chemical Water Treatment Equipment Repairman 2 **Choibalsan TPP installed capacity expansion project by 50 MW:** Ash removal unit worker 4, Heating technical repairman 5, DHA repairman 4, Fuel equipment repairman 5, Fuel accounting staff 2	113
	351	2141-25	Engineer, labor safety		**Tavantolgoi thermal power plant project**: Internal control 4, Labor safety 2	6
	351	7412-19	Electric fitter /dispatching equipment/		**Tavantolgoi thermal power plant project**: Shift fitter 12	12
	351	2111-18	Metallophysicist		**Tavantolgoi thermal power plant project**: Metal engineer 1, Metal technician 1	2
	351	8182-15	Operator, pressure pump equipment		**Tavantolgoi thermal power plant project:** Compressor machinist 4 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Compressor 4, Pump machinist 8	16
	351	8342-13	Driver, bulldozer		**Tavantolgoi thermal power plant project**: Bulldozer operator 2	2
	351	2141-35	Engineering, metrology, benchmarking, testing and calibration		**Tavantolgoi thermal power plant project**: Accuracy engineer 4	4
	351	2151-17	Engineer, power transmission		**Tavantolgoi thermal power plant project:** Power system and transmission network engineer 2, Relay protection engineer 4, Operation engineer 2 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** Relay, protection and automation engineer 1	9
	351	3112-36	State fire inspector		**Tavantolgoi thermal power plant project:** Fire inspector 2 **The project to increase the installed capacity of**	3

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
					TPP-3 state-owned JSC by 75 mW: Fire inspector 1	
	351	2142-11	Engineer, construction technology		**Tavantolgoi thermal power plant project**: Construction engineer 2	2
	351	7231-13	Mechanic, car		**Expansion of 50 MW combined heat and power generation of Amgalan thermal power plant**: Auto mechanic 3	3
	351	8332-17	Driver, truck with trailer /2-3 trailers		**The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW**: Heavy truck driver 3, Fine ash heavy truck driver 2, Emergency driver 4	9
	351	3131-11	Operator, electric power equipment		**Choibalsan TPP installed capacity expansion project by 50 MW**: Central Control Room Operators 16, Shift Operator 8	24
	351		Other workers		**Erdeneburen HPP:** Management, control, finance - 13, business staff -14 **The project to increase the installed capacity of TPP-3 state-owned JSC by 75 mW:** other 10 **Tavantolgoi thermal power plant project:** other 10 **Choibalsan TPP installed capacity expansion project by 50 MW:** Head of Finance Department 1, Warehouse Worker 3, Driver 2	62
Heat generation and distribution	353	2144-34	Mechanic, engineer, thermal	central heating plant construction projects in 10 provinces	Head 10, General engineer 10 Operation engineer 10	30
	353	3116-12	Laboratory assistant, chemical processing		Chemical laboratory assistant 20	20
	353	8111-28	Stove machinist, repairman		Stove machinist 80	120
	353	7411-11	Electrician		Equipment electrician 20	20
	353	8211-15	Assembler, pressure vessels, turbines, steam and water pipelines		Equipment repairer 20 Electricity, heating repairer 10	30
	353	8182-14	Operator, thermal plant		Fuel transfer equipment machinist 40 Assistant equipment machinist 40 Ash machinist 10 Fuel transfer master 10	100
	353	7126-12	Plumber, pipe fitter		Pipeline plumber 20	20
	353	7212-14	Welder		Welder 10	10
	353	8342-11	Tractor driver		Coal tractor driver 10	20
	353	8111-29	Pumpman, pump repairman		Pump dispatcher 352	352
	353	2145-13	Engineer, chemistry		Chemical workshop engineer 10	10
	353	2151-11	Engineer, electrical		Electric engineer 10	10

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
	353	3113-14	Technician, facility/electrical (electrical system)		Electric technician 10	10
	353	2141-26	Engineer, electrical automation		Automation engineer 10	10
	353	2142-21	Engineer, pipeline		Network engineer 10	10
	353	3115-30	Technician, gas pipeline equipment		Heating network technician 10	10
	353	3115-21	Technician, maintenance		Repair master 10	10
	353	2141-25	Engineer labor safety		HSE engineer 10	10
	353	2141-35	Engineer, metrology, benchmarking, testing and calibration		Savings and calculation engineer	10
	353	2522-17	Engineer, computer systems		Computer and information technology engineer	10
	353		Other workers			120

Water supply, drainage systems, waste disposal and environmental restoration activities

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Water storage, disinfection and distribution activities	36	2142-32	Engineer, water supply	**MCA Mongolia:** Construction of a new western source of water supply in Ulaanbaatar. New sources are built on the underground water deposits around the Bio combinate and Poultry Factory, and will be purified in accordance with drinking water standards in deep water purification facilities with advanced technology and supplied to the central water supply network of the city. The newly constructed plants will be the first and major infrastructure in Mongolia's water sector, so highly trained engineers and technicians will be needed. Although most of the stages are automated and have advanced technology, a relatively small number of engineers and technicians will be required (according to the current feasibility study, more than 70 of the two plants together), it will be an important field for training and qualification of students and more qualified personnel for schools that train specialists in the water sector.	Implementation of a program to train 100 engineers in the water sector and provide scholarships from the government to study at foreign universities (recommendations from the branch meeting on "Groundwater resources and problems" and "Surface water resources and problems" held in anticipation of the "Blue Gold" National Conference on Water Industry organized by the initiative of the President)	100
Water storage, disinfection and	36	7126-17	Plumber, pipeline /water supply/	According to the standard, one plumber is required to provide services to 200 households, but in Ulaanbaatar, one plumber is working for 225 households. There is a lack of human resources	It is necessary to increase the number of plumbers working in the field of water supply and sewage	308

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
distribution activities					services by 12.5%, and to eliminate the shortage of human resources. It is necessary to increase the total number of plumbers by 25% in accordance with the rapid increase in residential and other buildings in urban areas. 1230+25%=1538	
Drainage system	37	2142-33	Engineering, sewerage	**Ulaanbaatar new treatment plant:** Permanent jobs during operation 60 **MCA Mongolia:** Waste water recycling operations. The treated water of the New Central Treatment Plant (TCP) of Ulaanbaatar city will be recycled in the plant and it will be possible to reuse it as technical water for the production needs of thermal power plants (TPPs).	A total of 30 new engineers need to be trained for the Wastewater Recycling Plant to be built within the framework of the New Central Treatment Plant (TCP) and MCA project of Ulaanbaatar city.	30
Collection, processing, disposal and reuse of waste	38	2145-22	Technologist, chemical processing	Hazardous waste centralized facility project: capital, provincial centers, permanent jobs during operation 50 Waste-to-energy project: 2022-2023, number of permanent jobs during operation unknown. Priority professional areas of higher education (Appendix 1 of Resolution No. 115 dated March 29, 2023) Waste processing technology (071205)	60 experts are required in the field of waste processing technology engineering.	60

Construction

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Construction (residential, non-residential, industrial)	41	2142-11	Engineering, construction technology	General Construction Information System of the Ministry of Construction and Urban Development (https://mcis.gov.mn/mn/) data: 31030 engineers have been registered at 13511 entities with special licenses. In the academic year 2022-2023, 3409 students studying in bachelor's courses in civil and industrial construction, 666 students enrolled and 549 students graduated. Out of 95 projects, 66 projects do not include the total number of jobs in the database of the Ministry of Economy and development. For 29 projects, it is estimated that 115,569 jobs will be created during construction. According to the NSO labor force survey, 77,527 people worked in the construction industry in 2022. 38,042 jobs need to be added compared to the current industry labor force	70.2% (81,155) of the total jobs during construction are in civil and industrial buildings. This is estimated to be 70.2% of the 38,042 new jobs that demand exceeds the current labor force, resulting in an estimated 26,714 additional new jobs in the subsector. If consider that 14.8% of the labor force in the construction industry are specialists or engineers, 3,952 construction engineers are demanded	3952
Construction (residential, non-residential, industrial)	41	7111-11	Builder		If consider that 45.0% % of the labor force in the construction industry are construction workers, 12,021 professional builders are required.	12021
Construction (residential, non-residential, industrial)	41	8344-12	Operator, hoist		If consider that 10.6% of the labor force in the construction industry are construction mechanism operators and assemblers, 2832 crane operators and assemblers are required.	2832
Civil engineering activities (highways, railways, bridges, embankments, signal communications, power buildings)	42	2142-17	Engineering, roads and bridges	**34,414 of the total jobs** that will be created during construction **are related to the construction of engineering infrastructure such as roads, railways, power plants, and power transmission lines.** **2,062 of them are new jobs in road projects** (478 km of special purpose road in the direction of Tavantolgoi-Manlai-Khangi, 270 km of special purpose road from the end of the 32 km of road in the direction of Tavantolgoi-Baruunnaran in the Khanhongor sub-district of Umnogobi province to the "Tsagaandel uul" border crossing, Choibalsan in	The 2,062 new jobs created by the highway project represent 6% of the total jobs created by infrastructure projects. At 70.2% of this, it is estimated that 651 additional new jobs will be created in the road industry. If consider that 14.8% of the labor force in the construction industry are professional engineers or engineers, 214 auto road engineers are demanded. In other words, 18 companies and 18	40

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				Dornod province 124.5 km of paved road connecting the city to the port of Khavirga) **24,952 new jobs** to be created in the **railway project 1,150 new jobs** will be created by the **airport expansion project 6,250 new jobs** will be created in **energy construction and facilities projects.**	highway engineers will be needed to complete the 872.5 km highway in parts of 50 km each. Taking into account the growing needs, 40 road engineers are needed. Since the highway project is a project that has been implemented in the past, it is considered that previous companies can work on these projects	
	42	3112-37	Technician, railway, construction industry		According to the MRTD, between 2022 and 2028, 428 road and bridge technicians, 212 geodesy technicians, and 221 laboratory technicians are needed in the road industry	428
	42	3112-28	Technician, topographical			212
	42	3133-13	Laboratory assistant, chemical analysis			221
	42	2142-30	Engineering, railway		Considering that railway projects are relatively new projects that have not been implemented before, all jobs created by railway projects can be considered as new jobs. Assuming that 14.8% of the 24,952 new jobs created by the railway project are engineers, 3,693 railway construction engineers are required. But this is quite a large number, on the other hand, railway construction will be completed at that time. Therefore, 10 railway construction engineers are required for each of the 4 projects, for a total of 40 engineers	40
	42	2142-13	Engineer, construction		A total of 7,400 new jobs will be created in the expansion of airports (4 projects) and energy buildings and facilities (9 projects). A total of 9 projects require 10 engineers for a total of 90 engineers	90
	42	7114-12	Asphalt and concrete worker	According to MRTD data, 1905 wayfarers are required in road industry in 2022-2028.	29.8% (34,414) of the total jobs created during construction are in infrastructure. This is estimated at 29.8% of the 38,042 new jobs in excess of current labor demand, and an estimated 11,337 additional new	5101

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
					jobs in infrastructure projects. 5101 professional road construction workers are needed if we calculate using the structure where 45.0% of the workforce in the construction industry are professional construction workers.	
	42	8342-22	Operator, earthmoving equipment	According to MRTD data, 6420 operators are required in road industry in 2022-2028	Assuming that 10.6% of the construction labor force is construction machinery operators and assemblers, 1,202 road construction machinery operators and assemblers are needed. But here we used the statistics of MRTD	6420

Wholesale and retail trade, car and motorcycle repairs

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Wholesale and retail trade and repair of motor vehicles and motorcycles	45	2144-30	Mechanic, engineer, car	According to NSO data, as of Q3/2023, there are 2146 enterprises in the wholesale and retail sale and maintenance of motor vehicles and motorcycles. 1948 enterprises have 1-9 employees, 122 have 10-19 employees, 47 have 20-49 employees, and 26 have more than 50 employees. As of 2022, there are 1,264,892 vehicles registered in Mongolia. From 2013 to 2022, the number of vehicles increased by an average of 7.3% per year.	The number of cars is increasing every year and the car maintenance market is growing rapidly, which shows that there is a lot of job creation potential in this industry. It is necessary to train 10 new Auto Mechanic Engineers every year.	50
Wholesale and retail trade and repair of motor vehicles and motorcycles	45	3115-13	Mechanical engineering technician, car	In the academic year 2020-2021, 1,289 people enrolled the vocational education and training institution in the profession of Auto mechanic (TC8211-20), 25 Auto body repairer (TC8211-24), and 56 in Auto mechanic (TC3115-13). In the academic year 2022-2023, 1052 people enrolled the vocational education and training institution in the profession of Auto repairer (TC8211-20), 25 in Auto body repairer (TC8211-24), and 64 in Auto mechanic (TC3115-13).	It is necessary to increase number of auto mechanics (TC3115-13) 2 time every year.	620
Wholesale and retail trade and repair of motor vehicles and motorcycles	45	7231-13	Mechanic, car		It is necessary to increase number of Car repairer (TC8211-20) by 10% (105 repairers) every year. It is necessary to increase number of Car body repairer (TC8211-24) 4 times every year. 75 care body repairers are required every year	900

Transportation and warehouse

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Rail transport	491	3115-39	Technician, railway, operational	Ministry of Road Transport Development information was used directly	Integrated management and transport organization of railway operation 48	48
	491	3115-40	Technician, railway, locomotive		Carriage and carriage industry 27	27
	491	3115-36	Master, railway, construction industry		Road industry 38	38
	491	2142-58	Engineering, railway, alarm centralization prohibition		Railway Signaling 28 Signal communication network engineer 44	72
	491	2142-59	Engineering and wagon industry		Materials Engineer (main specialty of Railways) 26	26
	491	2142-56	Engineering, railway, bridge, pipe, artificial equipment		Engineer of man-made structures (major specialty is Railway) 45	45
	491	8311-11	Driver, ground train, locomotive		Locomotive machinist 162	162
	491	2522-17	Engineering, computer systems		IT, information technology	28
	491	2512-16	Software engineer		Software engineer 24	24
	491	2152-22	Engineering and telecommunications		Telecommunication engineer 47	47
	491	1349-21	Manager, Railway		Transport Management 53	53
Other land transport	492	2144-30	Mechanic, engineer, auto		Auto and mechanical engineer 100	100
	492	7231-13	Mechanic, auto		Repair mechanics 46 Car mechanics 68 Check mechanics 41	128
	492	2144-15	Engineering, auto		Auto engineer 97	97
	492	7231-13	Mechanic, auto		Car mechanic 91	91
	492	2152-31	Engineer, electronic		Mechatronic and electronic engineer 35	35
	492	1349-22	Manager, freight		Transport management 55	55
Water transport	50	2611-11	Lawyer		Maritime Law 34	34
	50	1120-44	Director, CEO, Shipping		Ship control 27	27
	50	2619-12	Expert		Maritime accident analysis and investigation expert	38
	50	2144-26	Engineer, ship		Ship Engineer 27	37
Air transport	51	3119-11	Technician, safety		Safety Manager 66	66
	51	2142-29	Engineer, airport		Aerodrome Engineer 86	86
	51	3115-14	Mechanical engineering technician, aviation		Aircraft technician 53	53
	51	5411-12	Lifeguard, firefighter		Firefighter 33	33

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
	51	3153-17	Flight controller		Flight controller 119	119
	51	4323-18	Personnel, flight operations		Flight Information Officer 148	148
	51	5111-11	Airport Service Officer		Aerodrome Service Officer 97	97
	51	5111-16	Service staff, airport		Safety Screening Examiner 56	56
	51	3154-12	Controller, air traffic		Communication and navigation technician 44	44
Warehousing and transportation support activities	52	2164-23	Planner, transport movement	Priority professional areas of higher education (Appendix 1 of Government Resolution No. 115 dated 29.03.2023) Logistics Management (041308)	Reducing traffic jam in Ulaanbaatar Due to the expansion of trade business and delivery services and the increasing demand, it is necessary to train specialists in the field of transport logistics and transport traffic planning. It is necessary to train 20 specialists every year, a total of 60-80 specialists.	70

Information and communication

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Graphic design, publishing	58	2166-16	Designer, publishing	According to NSO data, as of Q3/2023, there are 609 enterprises in the field of graphic design and publishing. 572 of the enterprises have 1-9 employees, 26 have 10-19 employees, 11 have 20-49 employees, and there are no enterprises with more than 50 employees.	Enterprises with more than 10 employees need to prepare 37 print designers	37
Film, video, television program production, recording and music and melody production activities	59	2166-13	Multimedia designer	According to NSO data, as of Q3/2023, there are 369 enterprises are operating in the field of film, video and television program production and recording, as well as music and melody production. 347 of the enterprises have 1-9 employees, 11 have 10-19 employees, 7 have 20-49 employees, and 4 have more than 50 employees. Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023): Graphic Design (021106)	Graphic multimedia developer 22 in 2021 and 25 in 2022	47
	59	3521-30	Technician, video recording equipment /sound/		Enterprises with more than 10 employees need to train 22 sound technicians	22
Broadcasting activities	60	3521-49	Technician, sound supervisor	According to the NSO data, as of Q3/2023, there are 609 enterprises 142 enterprises are operating in the field of broadcasting. 89 of the enterprises have 1-9 employees, 23 have 10-19 employees, 8 have 20-49 employees, and 22 have more than 50 employees	Enterprises with more than 10 employees need to train 53 sound technicians	53
Tele communications	61	2152-22	Engineering, telecommunications	In 2021, the Ministry of Digital Development and Communications conducted a survey of the demand and supply of human resources in the field of telecommunications and information technology. The demand for professional employees of the telecommunications and information technology has been determined based on the jobs that are created in the enterprise and the plan to recruit employees in the near future. A total of 38 enterprises participated in the survey. Based on the results of the research, demand for professionals in the field of ICT can be classified as high, medium and low demand.	In the study, the demand for 2021 and 2022 is determined, this demand is not fully satisfied during that period and continues to be maintained every year. Telecommunications engineer 133 in 2021 and 18 in 2022	151
Tele communications	61	2152-14	Engineer, aerospace		Утасгүй холбооны инженер 2021 онд 135, 2022 онд 10	145
Tele communications	61	3114-14	Technician, digital communications		Техникч оператор 2021 онд 127, 2022 онд 17	144
Tele communications	61	2152-31	Engineering, electronics	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115	Электроникийн инженер 2021 онд 60, 2022 онд 10	70

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
				dated 29.03.2023) Electronic engineering (071401)		
Computer programming, consulting and related activities	62	2512-11	Programmer	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023) Information technology (061304), Software engineering (071405) Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023) Software (061302)	Programmer 125 in 2021 and 103 in 2022	228
	62	2152-28	Engineering, digital/ hardware/ (computer)		Hardware engineer 65 in 2021 and 9 in 2022	74
	62	2511-13	Analyst, system/computer/		System analyst 6 in 2021 and 3 in 2022	9
	62	2511-14	Analyst, electronic technician/information technology/		System architecture 4 in 2021 and 7 in 2022	11
	62	2152-27	Engineering, electronics /data/		Database admin 10 in 2021 and 10 in 2022	20
	62	2522-13	Supervisor, network		Network engineer 81 in 2021 and 15 in 2022	96
	62	2522-14	Supervisor, system		System admin 9 in 2021 and 13 in 2022	22
	62	1330-11	Head, supervisor /manager/, agency, department, unit, shift /information communication/		ICT management 63 in 2021 and 9 in 2022	72
	62	2522-11	Supervisor, safety /computer/		System, safety engineer 15 in 2021 and 23 in 2022	38
	62	2511-14	Analyst, digital technical /information technology/		Business analyst 13 in 2021 and 8 in 2022	21
	62	2521-15	Database expert		Data analyst 3 in 2021 and 11 in 2022	14
	62	2152-15	Engineer, technologist, digital	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023) IoT technology (061901)	According to MDDC survey among enterprises, IoT technology 3 in 2021 and 11 in 2022 According to MUST School of ICT (53 enterprises in ICT and other industries) survey 22 in 2023 and 26 in 2024	48
	62	2120-19	Mathematician, applied mathematics	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023) Artificial Intelligence (061902)	According to MDDC survey among enterprises, Robot and artificial intelligence 2 in 2021 and 12 in 2022	114

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
					According to MUST School of ICT (53 enterprises in ICT and other industries) survey Artificial Intelligenece 32 in 2023 and 33 in 2024; Robot and artificial intelligence 21 in 2023 and 28 in 2024	
	62	2120-36	Statistician, applied statistics	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023) Data science (061204), Statistics (054201)	According to MUST School of ICT (53 enterprises in ICT and other industries) survey Data science 31 in 2023 and 38 in 2024	69

Professional, scientific and technical activities

Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Legal and registration activities (consulting services)	69	2611-11	Lawyer	Law activities (691)	There is no need to calculate additional demand. Lawyers and advocates specializing in business law and labor law ared emanded.	-
Legal and registration activities (consulting services)	69	2411-11	Auditor	Consulting on registration, accounting and auditing activities, tax matters (692)	There is no need to calculate additional demand. Preparing specialists in accounting, audit and tax consulting services and developing this professional field is important for business development.	-
Management consulting services	70	2421-12	Business consultant		There is no need to calculate additional demand. It is necessary to train specialized consultants for production and business development, and develop professional management consulting services.	-
Architectural and engineering operations, technical testing	71	2161-11	Architect building /civil/	Architectural, engineering and related consultancy services (711)	No additional demand is required for the architectural, engineering and related consulting services group (711). The existing engineers and technicians need to be qualified.	-
Architectural and engineering operations, technical testing	71	2111-22	Physician	Technical testing (712) activities	The demand for physicists and chemists is discussed in Chapter 721.	-
Architectural and engineering operations, technical testing	71	3111-13	Technician, physics		It is necessary to support and develop technical testing and analysis professional services aimed at businesses for the development of the agricultural and processing industries in Mongolia. It is necessary to train technicians and laboratory workers to work in those testing centers. 50 in total	50
Architectural and engineering operations, technical testing	71	3116-12	Laboratory assistant, chemcial processing		Totally 50	50
Scientific research and experimental research activities	72	2111-22	Physician	Scientific and experimental research work in natural sciences (721)	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023): Gas Engineering (072408), Animal History Histology (081104), Smart Technology (078812), Biomedicine (091401), Bio-engineering (078804), Biotechnology (051202), Nanoscience and Engineering (078801), Bio-Engineering (078804), Materials Science and Engineering (072201) Physics (053301), Biology (051101), Chemistry (053101)	50
Scientific research and experimental research activities	72	2113-13	Chemist			50
Scientific research and experimental research activities	72	2131-12	Biologist			50

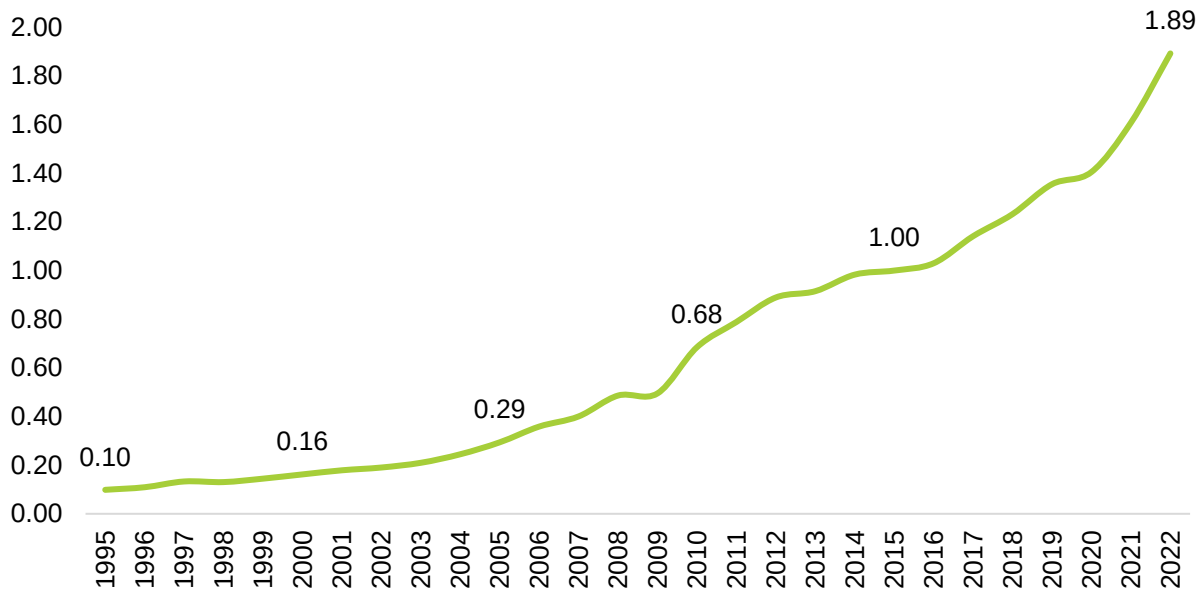
Sub-sectors	ISIC	ISCO-08	Occupations	Occupation conditions, definitions	Demand rationale	Demanded specialists
Scientific research and experimental research activities	72	2632-19	Sociologist	Social science, research, experimental research work (722) activities.	No need to calculate demand.	-
Advertising work and market research	73	2431-16	Analyst, market research		No need to calculate additional demand. Marketing and marketing research consultancy needs to be developed.	-
Professional design and other professional, scientific and technical activities	74	2163-13	Designer, product	Priority professional areas in higher education (Appendix No. 2 of Government Resolution No. 115 dated 29.03.2023): Production design (021203)	No need to calculate additional demand. Demand is included in the manufacturing industry.	-
Veterinary activities	75				Demand is included in the agriculture and animal husbandry	-

ANNEX 9. ESTIMATIONS OF SOME MACRO ECONOMIC INDICATORS

GDP deflator forecasting

The GDP deflator based on 2015 is calculated by comparing historical data from the past. This involves comparing the nominal GDP expressed in annual prices with the real GDP in 2015 prices. The results are depicted in the figure below:

Figure 38: Historical value of GDP deflator



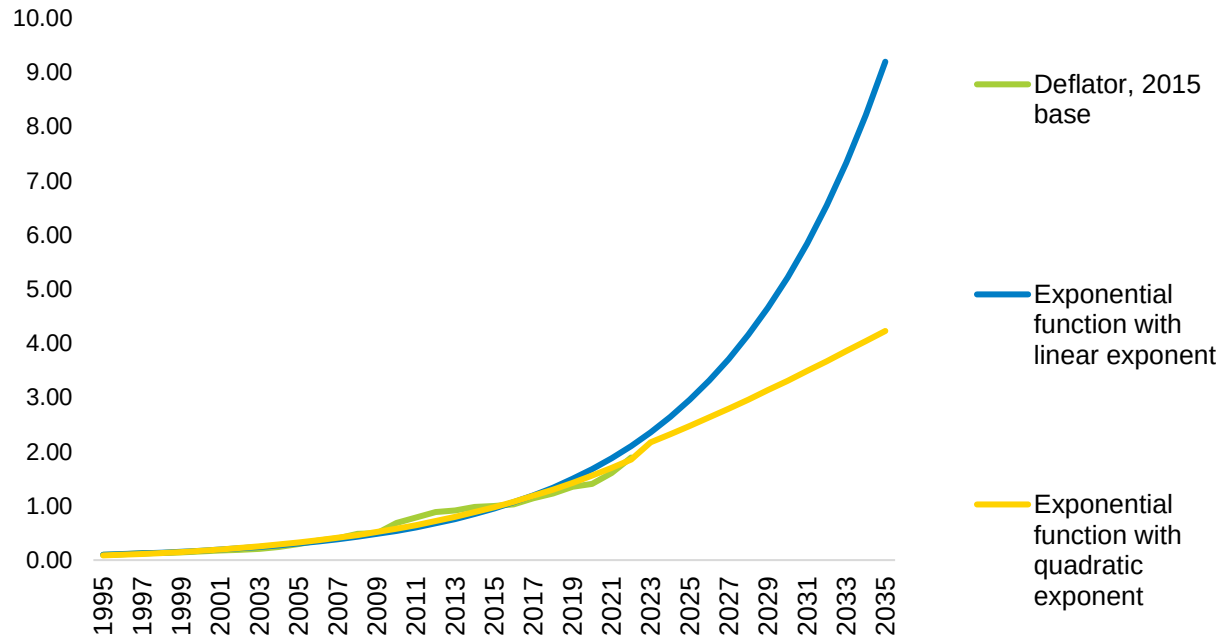
An exponential function with linear and quadratic exponents was employed to predict the future trend of the deflator. The assessment results are presented in the table below:

Table 80: Deflator forecast functions

Type of econometric model	*Exponential function with linear exponent*	*Exponential function with quadratic exponent*
Dependent variable	$\log(def_t)$	$\log(def_t)$
Constant term (intercept)	-2.32^{***}	-2.444^{***}
t	0.113^{***}	0.143^{***}
t^2		-0.0012^{***}
R^2	0.981	0.986
AR^2	0.980	0.984
Standard deviation of residuals	0.13	0.115
Akaike's Information Criterion (AIC)	-1.15	-1.38
Schwarz criterion / Bayesian Information Criterion (BIC)	-1.05	-1.23

The quadratic exponent function demonstrates stronger statistical consistency compared to the linear exponent function and is therefore selected for further forecasting.

Figure 39: Deflator's historical and forecasting values



Forecasting of deflator value is hsown in the table below.

Table 81: Deflator's historical and forecasting values

Он	Deflator, 2015 base	Exponential function with linear exponent	Exponential function with quadratic exponent
2022	1.89	2.11	1.85
2023		2.36	2.17
2024		2.64	2.32
2025		2.96	2.48
2026		3.32	2.63
2027		3.71	2.80
2028		4.16	2.96
2029		4.66	3.13
2030		5.22	3.31
2031		5.84	3.49
2032		6.55	3.67
2033		7.33	3.86
2034		8.21	4.04
2035		9.20	4.23

The forecasting generated by the exponential function with a quadratic exponent will be utilized in projecting nominal GDP from real GDP.

USD exchange rate forecasting

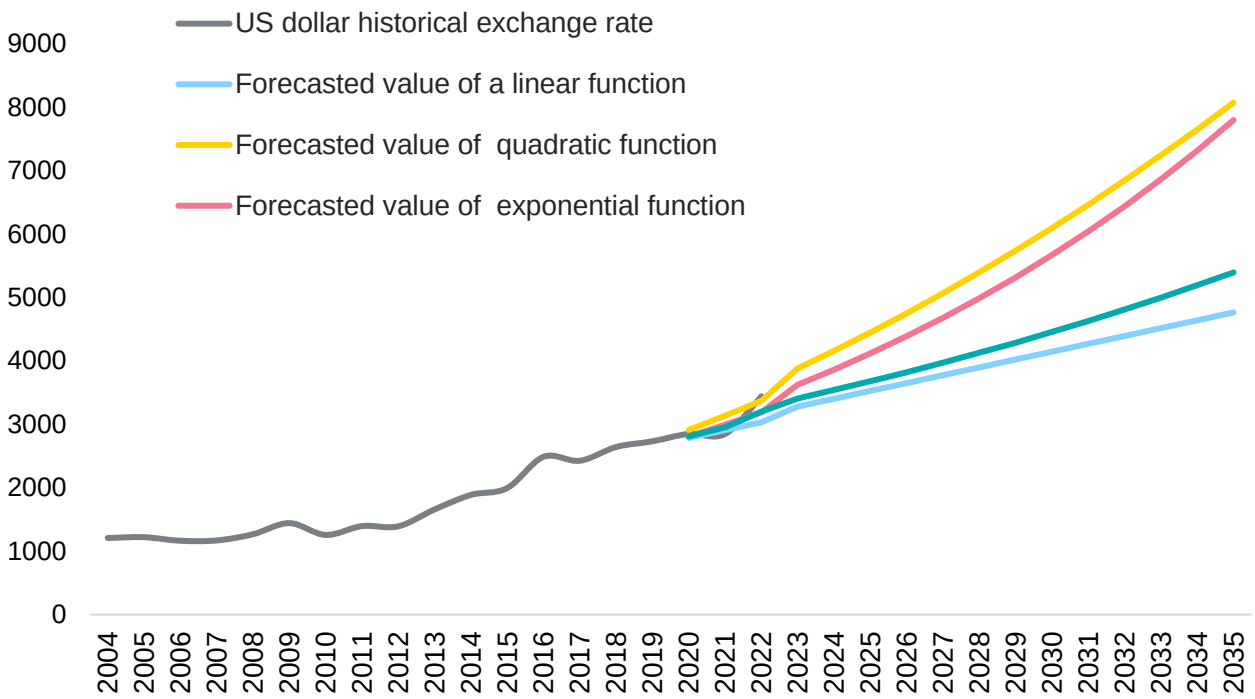
Year-end exchange rate data from 2004 to 2022 were utilized to project the USD exchange rate. Details of the hypothesized model evaluated using this data are presented in the table below.

Table 82: An evaluation of USD exchange rate forecasting models

Type of econometric model	*Linear function*	Quadratic *function*	Exponential *function*
Dependent variable	usd_t	usd_t	$\log(usd_t)$
Constant term (intercept)	807.45^{***}	1145.5^{***}	6.919^{***}
t	123.75^{***}	4.42	0.063^{***}
t^2		6.63^{***}	
R^2	0.90	0.964	0.93
AR^2	0.897	0.960	0.926
Standard deviation of residuals	235.2	146.63	0.10
Akaike's Information Criterion (AIC)	13.86	13.10	-1.65
Schwarz criterion / Bayesian Information Criterion (BIC)	13.96	12.98	-1.55

For the forecast of the USD, both exponential and quadratic forecasts tend to have higher values over longer periods. As the economic situation improves in the future, the exchange rate is expected to stabilize, aligning closer to the prediction of the linear model. Therefore, a mixed model combining 80% of the linear model and 20% of the quadratic model was utilized in the projections. The forecasted values calculated by each model are shown in the figure below.

Figure 40: Forecast values of the USD until 2035, in MNT, in 4 scenarios



The table below presents the forecasted values of the USD exchange rate calculated by the selected functions, as well as the values derived from the mixed scenario:

Table 83: Forecast values of the USD until 2035, in MNT, in 4 scenarios

	USD historical exchange rate	Forecasted value of a linear function	Forecasted value of quadratic function	Forecasted value of exponential function	Forecasted value of mixed model
2022	3445.0	3035.0	3373.1	3192.0	3202.0
2023		3282.5	3885.7	3626.6	3410.1
2024		3406.2	4162.0	3865.6	3543.1
2025		3530.0	4451.5	4120.4	3681.2
2026		3653.7	4754.2	4392.0	3824.8
2027		3777.5	5070.2	4681.4	3974.0
2028		3901.2	5399.5	4990.0	4129.0
2029		4025.0	5742.0	5318.8	4290.0
2030		4148.7	6097.8	5669.4	4457.3
2031		4272.5	6466.8	6043.1	4631.1
2032		4396.2	6849.1	6441.4	4811.8
2033		4520.0	7244.6	6865.9	4999.4
2034		4643.7	7653.5	7318.4	5194.4
2035		4767.5	8075.5	7800.8	5397.0

Mongolia's GDP forecasting, by industries

This table displays the projected GDP of Mongolia expressed in billion MNT from 2023 to 2035, with the GDP reaching 298,042 billion MNT in 2035.

Table 84: Mongolia's GDP, by divisions, at current prices, billion MNT

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	7,016	10,219	14,191	23,715
2	Mining and quarrying	12,402	24,114	48,448	78,932
3	Manufacturing	3,833	8,042	20,984	47,544
4	Electricity, gas, steam, air conditioning supply	761	1,127	2,337	6,207
5	Water supply; sewerage, waste management and remediation activities	237	447	1,002	3,032
6	Construction	1,784	2,677	5,142	7,595
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	5,678	8,547	16,122	27,976
8	Transportation and storage	2,511	4,127	7,418	14,534
9	Accommodation and food service activities	534	767	1,429	1,671
10	Information and communication	1,065	1,208	2,082	5,616
11	Financial and insurance activities	2,557	3,384	5,604	9,105
12	Real estate activities	2,452	3,593	5,153	8,426
13	Professional, scientific and technical activities	740	1,290	2,618	5,028
14	Administrative and support service activities	334	598	944	1,476
15	Public administration and defence; compulsory social insurance	2,357	2,653	4,350	7,447
16	Education services	2,182	3,170	6,049	11,843
17	Human health and social work activities	1,232	1,626	3,257	6,514
18	Arts, entertainment and recreation	207	308	527	902
19	Other service activities	218	335	601	857
20	Net taxes on products	5,753	8,467	16,023	29,621
GDP (purchaser's prices)		53,852	86,698	164,280	298,042
GDP (basic prices)		48,098	78,231	148,257	268,421

Annualized GDP is converted to 2015 constant prices in the following table, utilizing gross domestic product and industry price deflators. Initially, the GDP deflator was computed, followed by the calculation of the industry deflator. The GDP at 2015 comparable prices will increase by 2.5 times from 28,455 billion MNT in 2022 to 70,478 billion MNT in 2035. However, actual growth will vary by industries, with the highest growth being 3.8 times for Mining and Quarrying, 4.4 times for Manufacturing, 5.6 times for Electricity and Heating, and 7.8 times for Water, Wastewater, and Waste. Conversely, the agricultural sector will experience a growth of 1.6 times (61%).

Table 85: Mongolia's GDP, at 2015 constant prices, in billion MNT

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	4,252	4,940	5,129	6,845
2	Mining and quarrying	3,133	4,569	8,144	11,922
3	Manufacturing	2,343	3,444	5,994	10,189
4	Electricity, gas, steam, air conditioning supply	641	862	1,545	3,615
5	Water supply; sewerage, waste management and remediation activities	119	195	363	934

6	Construction	893	946	1,422	1,519
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	3,256	3,979	5,013	6,764
8	Transportation and storage	1,280	1,418	1,961	3,123
9	Accommodation and food service activities	349	445	691	692
10	Information and communication	783	776	960	1,885
11	Financial and insurance activities	1,457	1,578	1,960	2,547
12	Real estate activities	1,803	2,339	2,126	2,024
13	Professional, scientific and technical activities	486	761	1,285	1,948
14	Administrative and support service activities	234	385	523	602
15	Public administration and defence; compulsory social insurance	1,692	1,606	2,087	2,553
16	Education services	1,218	1,513	2,324	2,894
17	Human health and social work activities	662	744	1,195	1,642
18	Arts, entertainment and recreation	138	180	254	307
19	Other service activities	143	192	286	290
20	Net taxes on products	3,571	4,154	6,361	8,183
GDP (purchaser's prices)		28,455	35,026	49,624	70,478

In addition to expressing GDP in MNT, it is necessary to convert it into USD for international comparison. To achieve this, projections of the USD exchange rate against the MNT were made, and then distributed to the industries. The results are presented in the following table. In annual terms, Mongolia's GDP will amount to 17,123.8 million USD in 2022, increasing 3.2 times to 55,224.0 million USD in 2035.

Table 86: Mongolia's GDP, at current prices, million USD

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	2,231	2,776	3,184	4,394
2	Mining and quarrying	3,944	6,550	10,869	14,625
3	Manufacturing	1,219	2,185	4,708	8,809
4	Electricity, gas, steam, air conditioning supply	242	306	524	1,150
5	Water supply; sewerage, waste management and remediation activities	75	121	225	562
6	Construction	567	727	1,154	1,407
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	1,805	2,322	3,617	5,184
8	Transportation and storage	798	1,121	1,664	2,693
9	Accommodation and food service activities	170	208	321	310
10	Information and communication	339	328	467	1,041
11	Financial and insurance activities	813	919	1,257	1,687
12	Real estate activities	780	976	1,156	1,561
13	Professional, scientific and technical activities	235	350	587	932
14	Administrative and support service activities	106	162	212	274
15	Public administration and defence; compulsory social insurance	749	721	976	1,380
16	Education services	694	861	1,357	2,194
17	Human health and social work activities	392	442	731	1,207
18	Arts, entertainment and recreation	66	84	118	167

19	Other service activities	69	91	135	159
20	Net taxes on products	1,829	2,300	3,595	5,489
	GDP	17,124	23,551	36,856	55,224

The exchange rate of the USD also fluctuates, requiring a conversion from the current year price to the parallel price. The following table presents the results of 2015 comparable GDP in USD. The amount of Mongolia's GDP expressed at 2015 comparable prices in USD will be 14,439.4 million USD in 2022 and will increase to 35,763.4 million USD in 2035.

Table 87: Mongolia's GDP, by divisions, at 2015 constant prices, in million USD

№	Division	2022	2025	2030	2035
1	Agriculture, forestry, fishing and hunting	2,158	2,507	2,603	3,473
2	Mining and quarrying	1,590	2,319	4,132	6,050
3	Manufacturing	1,189	1,748	3,042	5,170
4	Electricity, gas, steam, air conditioning supply	325	437	784	1,834
5	Water supply; sewerage, waste management and remediation activities	61	99	184	474
6	Construction	453	480	722	771
7	Wholesale and retail trade; repair of motor vehicles and motorcycles	1,652	2,019	2,544	3,432
8	Transportation and storage	649	720	995	1,585
9	Accommodation and food service activities	177	226	350	351
10	Information and communication	397	394	487	956
11	Financial and insurance activities	739	801	994	1,292
12	Real estate activities	915	1,187	1,079	1,027
13	Professional, scientific and technical activities	247	386	652	989
14	Administrative and support service activities	119	195	266	305
15	Public administration and defence; compulsory social insurance	859	815	1,059	1,296
16	Education services	618	768	1,179	1,469
17	Human health and social work activities	336	378	606	833
18	Arts, entertainment and recreation	70	91	129	156
19	Other service activities	72	97	145	147
20	Net taxes on products	1,812	2,108	3,228	4,153
	GDP	**14,439**	**17,774**	**25,181**	**35,763**

Input-output table

Table 88: Input-output table in 2025, at current prices, in million MNT

IOT2025	Agriculture, forestry, fishing and hunting	Mining and quarrying	Manufacturing	Electricity, gas, steam, air conditioning supply	Water supply; sewerage, waste management and remediation activities	Construction	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and storage	Accommodation and food service activities	Information and communication	Financial and insurance activities
Agriculture, forestry, fishing and hunting	1,015,659	11,894	7,771,279	682	1,933	4,814	425	2,078	57,041	38	87
Mining and quarrying	19,726	7,902,917	636,873	859,642	1,902	245,135	61,966	53,827	10,159	6,522	7,865
Manufacturing	485,937	2,109,549	4,840,566	36,598	1,912	1,021,541	355,571	188,056	892,744	27,245	67,302
Electricity, gas, steam, air conditioning supply	71,323	1,249,100	823,585	2,124,635	25,942	216,139	463,999	183,798	63,138	67,397	74,166
Water supply; sewerage, waste management and remediation activities	93,148	104,663	72,323	170,159	13,282	32,090	39,766	21,007	14,259	6,604	5,967
Construction	341,682	3,915,814	31,121	18,708	1,375	628,562	150,925	51,343	16,566	16,414	125,641
Wholesale and retail trade; repair of motor vehicles and motorcycles	428,459	1,898,029	2,139,525	42,414	2,711	513,990	431,703	1,232,757	145,017	70,098	36,672
Transportation and storage	229,648	2,230,568	172,396	30,727	1,874	197,910	1,065,076	908,870	27,529	24,289	18,322
Accommodation and food service activities	1,555	458,412	36,057	1,457	413	17,008	125,336	57,615	3,837	12,700	12,062
Information and communication	15,095	436,779	140,245	4,213	166	73,858	218,576	170,908	11,463	100,716	129,092
Financial and	661,499	1,009,540	275,788	3,482	5,640	330,623	386,691	305,604	13,929	20,321	147,115

insurance activities											
Real estate activities	20,768	318,456	108,613	153	301	7,518	472,617	108,194	37,192	25,400	124,746
Professional, scientific and technical activities	96,387	730,939	40,338	800	92	95,461	33,433	8,082	10,621	22,250	144,765
Administrative and support service activities	178,576	299,905	68,223	1,203	6,336	23,722	144,319	371,442	42,616	44,173	21,919
Public administration and defence; compulsory social insurance	28,160	63,100	38,717	211	1,310	5,237	31,743	104,461	10,218	8,235	3,370
Education services	447	34,334	6,991	1,420	134	2,962	9,285	913	329	2,183	37,040
Human health and social work activities	5	29,273	15,806	46	10	9,686	33,903	17,981	370	1,640	30
Arts, entertainment and recreation	6	15,836	684	111	3	223	5,489	5,334	703	635	358
Other service activities	21,321	186,824	30,977	1,357	75	5,789	51,115	29,555	1,092	11,421	87,257
DOMESTIC CONSUMPTION, at base prices	3,709,378	23,006,127	17,249,836	3,298,047	65,413	3,432,275	4,081,958	3,821,840	1,358,812	468,284	1,043,782
IMPORTS	1,806,119	9,442,739	4,275,337	2,157,831	246,811	6,561,265	3,098,004	3,675,030	364,133	1,342,180	663,659
TAXES LESS SUBSIDIES ON PRODUCTS	473,508	1,100,392	995,765	619,768	53,464	1,015,346	795,310	1,191,404	140,597	319,888	82,376
TOTAL CONSUMPTION, at purchasers price	5,989,005	33,549,259	22,520,938	6,075,646	365,688	11,008,886	7,975,272	8,688,274	1,863,542	2,130,351	1,789,817
VALUE ADDED, at basic prices	10,218,960	24,113,883	8,041,877	1,127,441	446,762	2,677,085	8,547,396	4,127,199	766,906	1,208,127	3,384,189
TOTAL OUTPUT, at basic prices	16,207,965	57,663,142	30,562,815	7,203,087	812,450	13,685,971	16,522,669	12,815,472	2,630,448	3,338,479	5,174,006
IOT2025	**Real estate activities**	**Professional, scientific and technical activities**	**Administrative and support service activities**	**Public administration and defence; compulsory social insurance**	**Education services**	**Activities of households as employers**	**Arts, entertainment and recreation**	**Other service activities**	**Domestic intermediate consumption**	**Final consumption**	**Total consumption**

Agriculture, forestry, fishing and hunting	14	263	840	2,064	1,329	3,767	80	1,660	8,875,947	7,332,018	16,207,965
Mining and quarrying	2,823	19,381	17,250	801	9,130	5,429	2,168	3,514	9,867,030	47,796,112	57,663,142
Manufacturing	8,091	101,920	96,585	14,359	162,398	139,528	3,851	94,600	10,648,353	19,914,462	30,562,815
Electricity, gas, steam, air conditioning supply	32,279	90,227	137,488	19,741	246,222	117,185	44,487	36,789	6,087,639	1,115,448	7,203,087
Water supply; sewerage, waste management and remediation activities	2,598	7,920	11,314	7,161	20,926	17,408	3,695	3,333	647,624	164,825	812,450
Construction	985,662	54,401	8,133	9,339	64,163	30,115	10,447	47,249	6,507,660	7,178,312	13,685,971
Wholesale and retail trade; repair of motor vehicles and motorcycles	9,769	92,321	67,191	6,288	40,430	74,404	3,399	26,431	7,261,609	9,261,059	16,522,669
Transportation and storage	2,557	111,732	79,297	3,858	9,122	5,460	1,961	12,266	5,133,463	7,682,010	12,815,472
Accommodation and food service activities	361	24,567	37,263	10	1,707	1,936	848	1,676	794,822	1,835,626	2,630,448
Information and communication	6,591	67,415	67,499	5,514	16,208	14,149	2,572	16,530	1,497,587	1,840,892	3,338,479
Financial and insurance activities	7,825	201,245	85,186	1,732	4,595	1,689	1,298	1,980	3,465,782	1,708,224	5,174,006
Real estate activities	17,939	70,875	66,472	4,358	22,123	37,021	6,640	34,873	1,484,259	3,334,915	4,819,174
Professional, scientific and technical activities	8,239	94,489	43,069	25,053	43,964	24,444	6,357	46,501	1,475,283	1,764,222	3,239,505
Administrative and support service activities	4,065	32,830	131,015	31	1,982	1,484	646	6,743	1,381,231	799,031	2,180,262
Public administration and defence; compulsory social insurance	2,086	20,005	37,204	0	3,083	3,219	152	1,095	361,607	3,948,641	4,310,249
Education services	3	6,157	113	10,073	42,671	1,271	1,317	3,648	161,291	4,023,794	4,185,085
Human health and social work activities	4	484	39	1	275	3,017	26	2,064	114,661	3,062,952	3,177,613

Arts, entertainment and recreation	86	2,780	10,253	1,071	1,565	151	1,126	2,010	48,423	404,217	452,640
Other service activities	1,303	921	4,082	6	8,854	984	1,079	11,689	455,701	415,110	870,811
DOMESTIC CONSUMPTION, at base prices	1,092,311	999,939	900,297	111,461	700,748	482,661	92,151	354,651	66,269,972	123,581,871	189,851,843
IMPORTS	112,618	828,771	525,247	1,496,599	246,133	880,827	43,197	133,486	37,899,985		
TAXES LESS SUBSIDIES ON PRODUCTS	21,497	121,219	156,601	49,417	68,433	188,601	9,283	48,069	7,450,938		
TOTAL CONSUMPTION, at purchasers price	1,226,426	1,949,929	1,582,144	1,657,477	1,015,314	1,552,089	144,631	536,206	111,620,895		
VALUE ADDED, at basic prices	3,592,749	1,289,576	598,118	2,652,772	3,169,771	1,625,524	308,009	334,605	78,230,947		
TOTAL OUTPUT, at basic prices	4,819,174	3,239,505	2,180,262	4,310,249	4,185,085	3,177,613	452,640	870,811	189,851,843		

Table 89: Input-output table in 2030, at current prices, in million MNT

IOT2030	Agriculture, forestry, fishing and hunting	Mining and quarrying	Manufacturing	Electricity, gas, steam, air conditioning supply	Water supply; sewerage, waste management and remediation activities	Construction	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and storage	Accommodation and food service activities	Information and communication	Financial and insurance activities
Agriculture, forestry, fishing and hunting	806,964	17,497	14,187,768	748	114	4,282	395	2,323	67,745	34	47
Mining and quarrying	34,270	25,422,533	2,542,410	2,062,589	246	476,752	125,914	131,545	26,382	12,733	9,231
Manufacturing	968,599	7,785,868	22,170,477	100,749	283	2,279,440	828,960	527,281	2,659,987	61,027	90,632
Electricity, gas, steam, air conditioning supply	132,755	4,305,027	3,522,482	5,461,683	3,589	450,367	1,010,147	481,236	175,673	140,972	93,265
Water supply; sewerage, waste management and remediation activities	147,850	307,607	263,779	373,010	1,567	57,020	73,825	46,903	33,832	11,779	6,398
Construction	534,883	11,350,452	111,946	40,446	160	1,101,525	276,339	113,061	38,765	28,874	132,879
Wholesale and retail trade; repair of motor vehicles and motorcycles	569,625	4,672,359	6,536,001	77,877	268	764,967	671,286	2,305,416	288,195	104,724	32,938
Transportation and storage	336,315	6,048,560	580,128	62,147	204	324,458	1,824,344	1,872,306	60,265	39,973	18,128
Accommodation and food service activities	2,120	1,157,175	112,952	2,743	42	25,957	199,852	110,488	7,820	19,457	11,110
Information and communication	24,766	1,326,895	528,715	9,546	20	135,652	419,436	394,435	28,112	185,687	143,090
Financial and insurance activities	759,042	2,144,935	727,155	5,518	481	424,697	518,972	493,275	23,892	26,203	114,047
Real estate activities	29,530	838,428	354,862	300	32	11,967	785,986	216,401	79,050	40,585	119,834
Professional, scientific and technical activities	125,797	1,766,398	120,971	1,443	9	139,472	51,035	14,837	20,720	32,633	127,646

Administrative and support service activities	253,900	789,546	222,886	2,363	670	37,757	239,997	742,888	90,574	70,576	21,055
Public administration and defence; compulsory social insurance	34,462	142,987	108,875	357	119	7,175	45,437	179,829	18,693	11,326	2,786
Education services	875	124,488	31,455	3,840	20	6,493	21,265	2,516	963	4,803	49,001
Human health and social work activities	5	47,962	32,136	56	1	9,595	35,087	22,380	490	1,631	18
Arts, entertainment and recreation	6	28,921	1,550	151	0	246	6,331	7,401	1,036	703	239
Other service activities	31,260	507,181	104,358	2,748	8	9,501	87,654	60,954	2,393	18,817	86,430
DOMESTIC CONSUMPTION, at base prices	4,793,029	68,784,649	52,261,107	8,208,299	7,831	6,267,323	7,222,253	7,725,471	3,624,598	812,533	1,058,772
IMPORTS	4,446,100	25,731,169	10,524,375	6,327,983	480,994	12,889,837	9,005,401	7,606,676	647,896	3,192,031	1,655,859
TAXES LESS SUBSIDIES ON PRODUCTS	1,605,985	1,642,968	2,218,672	2,563,690	163,863	2,444,646	2,616,840	3,766,204	363,365	1,068,131	217,374
TOTAL CONSUMPTION, at purchasers price	10,845,114	96,158,785	65,004,154	17,099,972	652,688	21,601,806	18,844,494	19,098,351	4,635,859	5,072,694	2,932,005
VALUE ADDED, at basic prices	14,190,890	48,447,893	20,984,022	2,337,283	1,001,854	5,142,420	16,121,787	7,417,650	1,428,778	2,081,888	5,603,882
TOTAL OUTPUT, at basic prices	25,036,004	144,606,678	85,988,176	19,437,255	1,654,542	26,744,226	34,966,281	26,516,001	6,064,638	7,154,583	8,535,887

IOT2030	Real estate activities	Professional, scientific and technical activities	Administrative and support service activities	Public administration and defence; compulsory social insurance	Education services	Activities of households as employers	Arts, entertainment and recreation	Other service activities	Domestic intermediate consumption	Final consumption	Total consumption
Agriculture, forestry, fishing and hunting	11	274	530	2,268	897	1,982	34	1,376	15,095,290	9,940,714	25,036,004
Mining and quarrying	4,862	44,203	23,799	1,925	13,473	6,246	2,038	6,365	30,947,516	113,659,163	144,606,678
Manufacturing	15,989	266,697	152,883	39,581	274,951	184,204	4,154	196,634	38,608,396	47,379,780	85,988,176
Electricity, gas, steam, air	59,565	220,474	203,225	50,818	389,280	144,467	44,803	71,407	16,961,235	2,476,020	19,437,255

conditioning supply											
Water supply; sewerage, waste management and remediation activities	4,089	16,504	14,260	15,720	28,212	18,301	3,174	5,517	1,429,347	225,195	1,654,542
Construction	1,529,723	111,799	10,111	20,219	85,316	31,224	8,849	77,132	15,603,703	11,140,523	26,744,226
Wholesale and retail trade; repair of motor vehicles and motorcycles	12,876	161,131	70,938	11,561	45,656	65,516	2,445	36,643	16,430,424	18,535,857	34,966,281
Transportation and storage	3,713	214,812	92,221	7,814	11,347	5,296	1,554	18,733	11,522,316	14,993,685	26,516,001
Accommodation and food service activities	488	43,968	40,341	19	1,977	1,749	625	2,383	1,741,267	4,323,371	6,064,638
Information and communication	10,721	145,203	87,943	12,512	22,588	15,375	2,283	28,281	3,521,259	3,633,323	7,154,583
Financial and insurance activities	8,902	303,151	77,624	2,749	4,478	1,283	806	2,370	5,639,579	2,896,308	8,535,887
Real estate activities	25,288	132,298	75,057	8,569	26,718	34,864	5,109	51,707	2,836,585	4,280,764	7,117,349
Professional, scientific and technical activities	10,660	161,895	44,638	45,220	48,737	21,130	4,489	63,288	2,801,018	4,009,717	6,810,735
Administrative and support service activities	5,729	61,279	147,927	62	2,394	1,398	497	9,997	2,701,495	1,110,757	3,812,252
Public administration and defence; compulsory social insurance	2,531	32,141	36,157	0	3,204	2,609	100	1,398	630,186	6,353,994	6,984,180
Education services	6	15,827	176	27,277	70,973	1,649	1,395	7,450	370,473	7,365,352	7,735,824
Human health and social work activities	3	562	27	1	207	1,768	12	1,905	153,846	6,291,842	6,445,688
Arts, entertainment and recreation	84	3,600	8,030	1,461	1,311	98	601	2,067	63,836	657,370	721,205
Other service activities	1,894	1,773	4,753	11	11,026	956	856	17,871	950,444	685,116	1,635,560
DOMESTIC CONSUMPTION, at base prices	1,697,125	1,937,588	1,090,642	247,786	1,042,744	540,115	83,826	602,524	168,008,216	259,958,848	427,967,064
IMPORTS	207,754	1,968,234	1,275,915	2,341,834	486,394	2,053,103	90,081	261,340	91,192,975		

TAXES LESS SUBSIDIES ON PRODUCTS	59,170	286,723	501,893	44,502	158,092	595,534	20,260	170,950	20,508,862
TOTAL CONSUMPTION, at purchasers price	1,964,050	4,192,544	2,868,450	2,634,122	1,687,230	3,188,753	194,167	1,034,813	279,710,052
VALUE ADDED, at basic prices	5,153,300	2,618,191	943,802	4,350,058	6,048,594	3,256,935	527,038	600,747	148,257,011
TOTAL OUTPUT, at basic prices	7,117,349	6,810,735	3,812,252	6,984,180	7,735,824	6,445,688	721,205	1,635,560	427,967,064

Table 90: Input-output table in 2035, at current prices, in million MNT

IOT2035	Agriculture, forestry, fishing and hunting	Mining and quarrying	Manufacturing	Electricity, gas, steam, air conditioning supply	Water supply; sewerage, waste management and remediation activities	Construction	Wholesale and retail trade; repair of motor vehicles and motorcycles	Transportation and storage	Accommodation and food service activities	Information and communication	Financial and insurance activities
Agriculture, forestry, fishing and hunting	753,513	32,199	29,998,480	2,778	2,509	4,598	305	5,289	85,222	269	15
Mining and quarrying	45,774	66,920,653	7,689,506	10,954,105	7,724	732,320	138,942	428,468	47,473	146,015	4,316
Manufacturing	1,164,666	18,450,217	60,364,407	481,681	8,022	3,152,028	823,466	1,546,109	4,308,986	630,010	38,146
Electricity, gas, steam, air conditioning supply	180,190	11,515,711	10,826,175	29,475,701	114,700	702,990	1,132,707	1,592,855	321,234	1,642,778	44,311
Water supply; sewerage, waste management and remediation activities	121,801	499,414	492,058	1,221,824	30,395	54,020	50,245	94,226	37,548	83,314	1,845
Construction	462,988	19,362,473	219,416	139,203	3,260	1,096,502	197,610	238,652	45,205	214,582	40,261
Wholesale and retail trade; repair of motor vehicles and motorcycles	612,556	9,902,170	15,915,407	332,988	6,782	946,029	596,376	6,045,702	417,525	966,884	12,399
Transportation and storage	506,440	17,950,274	1,978,129	372,103	7,234	561,882	2,269,572	6,875,419	122,261	516,791	9,555
Accommodation and food service activities	2,391	2,571,649	288,416	12,297	1,112	33,662	186,183	303,830	11,881	188,370	4,385
Information and communication	36,358	3,839,069	1,757,611	55,722	701	229,025	508,713	1,412,107	55,601	2,340,470	73,531
Financial and insurance activities	749,985	4,176,741	1,626,905	21,680	11,190	482,581	423,629	1,188,544	31,804	222,279	39,444
Real estate activities	32,711	1,830,360	890,106	1,323	830	15,245	719,289	584,565	117,970	385,981	46,465
Professional, scientific and technical activities	126,106	3,489,709	274,595	5,751	211	160,788	42,266	36,271	27,983	280,857	44,790
Administrative and support service activities	238,895	1,464,059	474,871	8,841	14,834	40,855	186,554	1,704,542	114,812	570,128	6,934
Public administration and	26,901	219,966	192,441	1,108	2,190	6,441	29,301	342,312	19,658	75,902	761

defence; compulsory social insurance											
Education services	1,230	345,069	100,180	21,476	646	10,503	24,710	8,630	1,824	57,993	24,124
Human health and social work activities	3	64,777	49,869	154	11	7,562	19,865	37,402	452	9,595	4
Arts, entertainment and recreation	4	40,482	2,493	427	3	201	3,715	12,818	991	4,289	59
Other service activities	27,637	883,672	208,912	9,658	171	9,660	64,020	131,412	2,850	142,825	26,747
DOMESTIC CONSUMPTION, at base prices	5,090,187	163,557,088	133,352,332	43,118,081	212,522	8,246,917	7,417,430	22,589,118	5,771,378	8,479,292	418,091
IMPORTS	10,496,091	68,057,099	24,844,948	17,231,580	867,474	18,858,109	25,723,931	14,707,718	968,794	8,124,963	3,748,477
TAXES LESS SUBSIDIES ON PRODUCTS	5,008,817	2,827,520	5,620,922	7,364,290	473,855	5,496,679	7,989,871	9,382,223	891,559	3,295,501	545,872
TOTAL CONSUMPTION, at purchasers price	20,595,095	234,441,707	163,818,203	67,713,951	1,553,851	32,601,706	41,131,233	46,679,059	7,631,732	19,899,756	4,712,441
VALUE ADDED, at basic prices	23,715,246	78,932,344	47,544,148	6,207,419	3,031,672	7,595,454	27,975,991	14,534,300	1,671,105	5,615,819	9,104,669
TOTAL OUTPUT, at basic prices	44,310,341	313,374,051	211,362,350	73,921,370	4,585,524	40,197,160	69,107,224	61,213,359	9,302,837	25,515,575	13,817,109

IOT2035	Real estate activities	Professional, scientific and technical activities	Administrative and support service activities	Public administration and defence; compulsory social insurance	Education services	Activities of households as employers	Arts, entertainment and recreation	Other service activities	Domestic intermediate consumption	Final consumption	Total consumption
Agriculture, forestry, fishing and hunting	21	386	364	3,178	1,071	2,098	40	1,263	30,893,598	13,416,743	44,310,341
Mining and quarrying	13,247	89,044	23,337	3,858	23,004	9,457	3,371	8,363	87,288,976	226,085,075	313,374,051
Manufacturing	39,219	483,647	134,957	71,415	422,615	251,051	6,184	232,562	92,609,389	118,752,961	211,362,350
Electricity, gas, steam, air conditioning supply	164,920	451,323	202,504	103,499	675,418	222,255	75,298	95,333	59,539,903	14,381,467	73,921,370
Water supply; sewerage, waste management and remediation activities	6,871	20,505	8,625	19,433	29,710	17,088	3,237	4,470	2,796,629	1,788,894	4,585,524

Construction	2,701,018	145,949	6,425	26,261	94,400	30,634	9,484	65,670	25,099,994	15,097,166	40,197,160
Wholesale and retail trade; repair of motor vehicles and motorcycles	28,245	261,329	56,004	18,655	62,761	79,857	3,256	38,759	36,303,683	32,803,540	69,107,224
Transportation and storage	11,404	487,857	101,951	17,655	21,841	9,040	2,897	27,747	31,850,051	29,363,307	61,213,359
Accommodation and food service activities	1,122	74,777	33,397	32	2,850	2,235	873	2,643	3,722,104	5,580,733	9,302,837
Information and communication	32,107	321,500	94,784	27,563	42,389	25,584	4,150	40,838	10,897,823	14,617,752	25,515,575
Financial and insurance activities	17,942	451,750	56,307	4,076	5,656	1,437	986	2,303	9,515,238	4,301,872	13,817,109
Real estate activities	57,141	221,025	61,038	14,243	37,833	43,775	7,007	56,339	5,123,248	6,869,352	11,992,600
Professional, scientific and technical activities	21,799	244,765	32,851	68,020	62,453	24,009	5,572	62,403	5,011,200	8,548,805	13,560,005
Administrative and support service activities	10,996	86,958	102,181	87	2,879	1,491	579	9,252	5,039,749	1,645,364	6,685,113
Public administration and defence; compulsory social insurance	4,030	37,838	20,720	0	3,197	2,308	97	1,073	986,246	10,829,806	11,816,052
Education services	18	33,572	182	57,569	127,605	2,628	2,430	10,307	830,697	13,856,204	14,686,901
Human health and social work activities	5	581	14	1	181	1,373	10	1,284	193,143	12,860,081	13,053,225
Arts, entertainment and recreation	121	3,856	4,187	1,557	1,190	79	529	1,444	78,446	1,076,674	1,155,121
Other service activities	3,415	2,364	3,085	15	12,460	958	937	15,541	1,546,339	899,747	2,446,086
DOMESTIC CONSUMPTION, at base prices	3,113,584	3,419,015	942,908	437,115	1,629,507	727,359	126,937	677,595	409,326,457	532,775,543	942,102,000
IMPORTS	297,926	4,484,150	2,763,035	3,341,549	878,572	4,586,847	86,665	465,179	210,533,108		
TAXES LESS SUBSIDIES ON PRODUCTS	155,281	629,275	1,503,040	590,533	335,438	1,225,158	39,283	446,297	53,821,413		
TOTAL CONSUMPTION, at purchasers price	3,566,791	8,532,440	5,208,982	4,369,196	2,843,517	6,539,363	252,885	1,589,071	673,680,978		
VALUE ADDED, at basic prices	8,425,809	5,027,565	1,476,130	7,446,856	11,843,384	6,513,861	902,236	857,014	268,421,022		
TOTAL OUTPUT, at basic prices	11,992,600	13,560,005	6,685,113	11,816,052	14,686,901	13,053,225	1,155,121	2,446,086	942,102,000		

ANNEX 10. RELATIONSHIP BETWEEN SKILL LEVELS IN THE INTERNATIONAL STANDARD CLASSIFICATION OF OCCUPATIONS (ISCO-08) AND EDUCATIONAL LEVELS IN THE INTERNATIONAL STANDARD CLASSIFICATION OF EDUCATION (ISCED-97)

ISCO-08 major groups	Skill level	ISCED-97 group		
1 Manager	3 + 4	Master's degree or higher education degree	Bachelor	
2 Professionals	4	Master's degree or higher education degree	Bachelor	
3 Technicians and associate professionals	3	Bachelor	Diploma	
4 Clerical support workers	2	Technical and vocational education	Upper secondary education	Lower secondary education
5 Services and sales workers	2	Technical and vocational education	Upper secondary education	Lower secondary education
6 Skilled agricultural, forestry and fishery workers	2	Technical and vocational education	Upper secondary education	Lower secondary education
7 Craft and related trades workers	2	Technical and vocational education	Upper secondary education	Lower secondary education
8 Plant and machine operators, and assemblers	2	Technical and vocational education	Upper secondary education	Lower secondary education
9 Elementary occupations	1	Primary education		
10 Armed forces occupations	1 + 2 + 4			

ISCO-08 skill level	Description of skill level
4	Tasks to solve complex problems, make decisions, and approach creatively based on theoretical and practical knowledge of the field of specialization. Research and analysis to expand people's knowledge in a certain direction, diagnosis and treatment of diseases, providing knowledge to others, construction, production process, construction, machinery and equipment model design. The knowledge and skills to work at this level are acquired as a result of 3-6 years of study at a higher education institution and the completion of a bachelor's degree or higher.
3	Complex technical and practical tasks that require a wide range of practical, technical and procedural knowledge in the field of specialization. Tasks to comply with health and safety guidelines and relevant regulations; prepare detailed estimates of materials, labor quantities, and costs required for the project; coordinating, supervising, directing and planning the activities of other employees; perform technical functions with expert support. Occupations at this skill level generally require a high level of literacy, numeracy and communication skills. These skills include the ability to read and understand complex documents, prepare factual reports, and communicate in complex situations. The knowledge and skills to work at this level are obtained as a result of studying at a higher education institution after graduating from secondary school.
2	Tasks to work on machinery and electrical equipment; drive a vehicle; operate and repair electrical and mechanical equipment; organize, classify, and store information. Most

	occupations require the ability to read information such as safety instructions, record and record work performed, and perform simple arithmetic calculations without error. Many occupations at this level require relatively advanced literacy and numeracy skills and communication skills. In some occupations, these skills are an essential part of the job. Most occupations at this level require a high level of manual talents.
1	Simple, repetitive physical and manual tasks. Hand tools such as shovels and trowels and simple power tools such as vacuum cleaners may be required. Clean; dig; lift and carry things by hand; manual sorting, harvesting and collection of products; operating a non-motorized vehicle; pick fruits and vegetables. There are tasks that require physical strength and endurance. Some jobs may require basic literacy and numeracy skills. But this is not the main part of the work