

Towards Higher Education Excellence in Central Asia

A Roadmap for Improving the Quality of
Education and Research through Regional
Integration

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in Central Asia:
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and Research through Regional Integration**

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Abbreviations

ADB	Asian Development Bank
ARWU	Academic Ranking of World Universities
ASEAN	Association of Southeast Asian Nations
AUCA	American University in Central Asia
CA	Central Asia
CANQA	Central Asian Network of Quality Assurance
CARICOM	Caribbean Community
CHEA	Council for Higher Education Accreditation
CIS	Commonwealth of Independent States
DAAD	Deutscher Akademischer Austauschdienst
ECTS	European Credit Transfer and Accumulation System
EHEA	European Higher Education Area
ENIC-NARIC	European Network of Information Centres and National Recognition Information Centre
ENLACE	Espacio Latinoamericano y Caribeño de Educación Superior
ENQA	European Association for Quality Assurance in Higher Education
EQF	European Qualifications Framework
ERIH PLUS	European Reference Index for the Humanities and the Social Sciences
ESG	Standards and guidelines for quality assurance in the European Higher Education Area
EU	European Union
EurAsEC	Eurasian Economic Community
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit
HEI	Higher Education Institution
ICT	Information and Communication Technologies
IITU	International Information Technology University
ISCED	International Standard Classification of Education
IUK	International University of Kyrgyzstan
JASSO	Japan Student Services Organization
KAZGUU	Kazakh Humanities and Law Institute named after M. Narikbayev
KBTU	Kazakh British Technical University
KPI	Key Performance Indicators
LMS	Learning management system
MEXT	Ministry of Education, Culture, Sports, Science and Technology of Japan Scholarship
NEDB	National Education Database
NST	National Scholarship Test
OECD	Organization for Economic Cooperation and Development
Ph.D.	Doctor of Philosophy
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
PIRLS	Progress in International Reading Literacy Study
PPP	Public-Private Partnership
QS EECA	Quacquarelli Symonds Emerging Europe & Central Asia University Ranking
R&D	Research and Development
RSCI	Russian Science Citation Index
SAC	Supreme Attestation Commission
SCO	Shanghai Cooperation Organization
STEM	Science, technology, engineering, and mathematics
THE	Times Higher Education Ranking
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
UCA	University of Central Asia

Executive Summary

Central Asia is a region with a large and dynamic higher education sector that has undergone significant transformations since its economic transition. Central Asian countries have generally been successful in their economic transition, gradually adapting to the demands of a market economy. They have progressively improved both internal and external quality assurance mechanisms, modernized their doctoral training, adopted standardized admission procedures, and supported the establishment of private higher education institutions. Moreover, progress has been made in the implementation of national qualifications frameworks and in the internationalization of the overall sector, from student mobility to research cooperation. In addition, all Central Asian countries have expanded their national higher education systems and participation rates have increased, with the number of higher education institutions nearly doubling in Kazakhstan and more than doubling in Uzbekistan, Kyrgyzstan, and Tajikistan since their independence. Collectively, these countries now boast over 430 universities and cater to 1.8 million students.

The current socio-economic context in Central Asia presents new challenges for higher education systems in the region. The COVID-19 pandemic and declining prices for raw materials have prompted the need for a new economic model based on the production of high-value added goods and services while ensuring sustainable development. At the same time, this transition to an innovative, green economy requires highly skilled professionals and increased human capital productivity, particularly in priority economic sectors. However, most national higher education systems in Central Asia are not fully equipped to provide the necessary skills and competencies required for this shift. Moreover, the challenges facing higher education systems in the region are compounded by demographic pressure, brain drain, poverty and unemployment.

The purpose of this Report is to provide recommendations for addressing common challenges while promoting academic and research excellence in higher education in Central Asia through regional cooperation between Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. Regional integration of higher education systems in Central Asia has the potential to drive positive changes in the sector and to generate significant economic and social benefits overall. By fostering cooperation, knowledge sharing and resource pooling among universities, the quality of higher education, research and innovation in Central Asia can be enhanced. This can be achieved through the establishment of centers of excellence, world-class universities and regional hubs that can attract highly qualified students and workers. Moreover, the regional integration of higher education systems offers an effective platform for sharing best practices and receiving support from regional leaders. The harmonization of academic standards facilitates the recognition of qualifications across countries, contributing to the mobility of students, faculty and workers, enabling them to participate in regional labor markets. This, in turn, stimulates the development of industries that are important to the economies of Central Asian countries. Finally, greater cooperation in higher education can play a crucial role in establishing a dynamic knowledge-based economy and enable Central Asia to move away from extractive industries – to ultimately achieve competitiveness on the global level.

Several regional higher education initiatives have been implemented worldwide, but not yet in Central Asia. Regionalization projects have proven to be an effective instrument to address common challenges in higher education and improve academic and scientific outcomes. The Bologna Process, which established the European Higher Education Area, was one of the drivers and benchmarks of regionalization, supporting cooperation between countries and universities on a wide range of topics. Since then, regional higher education integration projects have been launched in Africa, Southeast Asia, Latin America, and other regions. However, despite similarities between their higher education systems as well as shared challenges and opportunities, Central Asian countries have yet to develop their own framework for cooperation in higher education. As such, the adoption of the Turkestan Declaration in 2021 by Kazakhstan, Kyrgyzstan, Turkmenistan, and Uzbekistan marks an important milestone in intensifying the regional integration process.

Benefits of regional integration in higher education for Central Asia

Why regionalization in higher education?	Benefits for Central Asia
<ul style="list-style-type: none"> • Improving resource efficiency by the pooling resources and economies of scale. • Promoting educational and labor mobility to reduce imbalances in supply and demand for skills. • Concentrating resources to create regional hub and accumulate a critical mass of talent. • Addressing common regional and global challenges, while stimulating specific growing sectors. • Raising quality standards in teaching and research to the level of regional champions. • Fostering horizontal cooperation between regional universities and research centers and dissemination of best practices. 	<ul style="list-style-type: none"> • Decreasing brain drain by creating regional centers of excellence and more integrated qualifications and labor space. • Increasing resource efficiency amid growing enrollment and demographic pressure. • Establishing a globally visible regional hub for education and science that each country cannot afford individually. • Shared investments in infrastructure to promote research and development in the region’s priority economic sectors. • Reducing information asymmetries and increasing the trust between universities. • Cooperation between national innovation ecosystems to reduce dependence on exports and the transition to a knowledge-based economy.

Each Central Asian country has its own strengths in the higher education system that others can learn from. For instance:

- **Kazakhstan** is leading the way when it comes to the implementation of reforms granting universities more financial and managerial autonomy. The country has made substantial progress in improving the quality of school education and preparing university entrants. It has succeeded in establishing a modern research infrastructure and reforms have been introduced to encourage private investment in research and development. The country shows a successful example of harmonization of the educational space in accordance with the Bologna principles.
- **Kyrgyzstan** has developed a successful internationalization model and manages to attract many international students to its universities – becoming a world leader in this respect. The country also is making progress in the internationalization of higher education management and independent external quality assurance.
- **Tajikistan** is hosting the University of Central Asia, a successful example of international cooperation between Central Asian countries and the private sector to establish a higher education institution providing quality teaching and research, with a clear social mission. The country has strengthened its international partnership in accreditation and compliance with ESG principles. Tajikistan is now implementing several reforms to amplify the academic staff capacity and internationalization of the sector.
- **Uzbekistan** adopted an attractive model for the remuneration of teaching and research staff, including junior researchers. The country is rapidly increasing participation in higher education and has taken successful steps to improve the quality of training of scientific and teaching staff, including through the recruitment of foreign specialists to work at national universities. Uzbekistan is also quickly developing a strong innovation ecosystem by providing incentives to researchers to innovate.

At the same time, Central Asian countries face common challenges when it comes to developing their higher education systems. Using statistical data, desk research and expert focus groups, this Report found challenges in higher education common to all countries of the region. These challenges are grouped in three areas, highlighted throughout the Report: access, relevance, and quality of higher education; research and innovation in the higher education sector; and regional integration of higher education systems. However,

Central Asian countries also share opportunities to address these challenges through regional cooperation and integration, which would be key enablers for academic and research excellence in the region.

The challenges in relevance and quality of higher education are materialized in the average low quality of teaching, outdated learning infrastructure, still relatively modest participation rates, and skill mismatch.

- **Quality of higher education remains a major issue**, stemming in part from the limited attractiveness of the teaching profession, with low salaries and the absence of transparent financial incentives linked to staff performance further exacerbating the problem. Moreover, faculty members are overworked, with heavy teaching loads, and many lack modern teaching and research skills – in fact, only around a third of professors in Central Asia have Ph.D. degrees or equivalent. University staff is aging, while the training of postgraduate students is limited. Indeed, the share of postgraduate/Ph.D. students in the region ranges from 0.5% to 1.2% of the total number of students, well below the average of European countries. In parallel, both internal and external quality assurance systems in all countries require modernization to ensure adequate quality of education. Infrastructure problems mainly include wear and tear of buildings and classrooms, outdated learning materials, obsolete equipment, and insufficient digital capacities.
- **Participation in higher education is gradually increasing, however, Central Asia still lags behind global averages.** Some countries have achieved important improvements on this front: while total participation remains low, enrollments in Uzbekistan have quadrupled over the last ten years. At the same time, social disparities in access to higher education persist, while inter-regional disparities are especially pronounced, leaving access to quality higher education as a social privilege. Indeed, higher education in Central Asia is expensive – on average, tuition fees amount to 30-60% of the average per capita income, making university studies unaffordable to many. Moreover, some countries in the regions are still facing gender gaps in university participation, especially when it comes to enrollment in science and technology programs.
- **The industry-university linkages remain weak, with educational programs misaligned with the needs of the labor market.** Central Asian countries rank at the bottom of international rankings in terms of the ease of finding skilled employees, because of entrenched skill mismatches across the economy. Critically, on top of overall low quality of education, there is an insufficient development of soft, digital, and green skills among university students, which negatively impacts their prospects in the labor market. On average, half of higher education graduates obtain a diploma in social sectors, such as education and healthcare, whereas these sectors account for only 10% of total employment. Finally, insufficient enrollment in master's programs, with the share of master's students averaging 5% of the total number of students, contributes to a scarcity of highly qualified professionals for both universities and the private sector. All this contributes to chronic labor market supply and demand imbalances, which are expected to worsen in the next years, as the demographic pressure intensifies.

Low research capacity and limited transfer of innovations reflect inadequate research infrastructure and lack of research skills.

- **Low research productivity prevents the region from securing a prominent presence in the research space worldwide.** Central Asia's overall share in the total number of publications worldwide barely exceeds 0.1%. This is well below what would be expected from the region based on its population and economic development. The situation is progressively improving, with the total number of publications increasing in all countries. However, the quality of these publications is low, and the distribution of scientific findings is largely limited to local audiences due to a lack of effective infrastructure for dissemination of research results. For example, the number of publications with zero citation has more than doubled in all countries of the region.
- **The research capacity of Central Asian universities also suffers from lack of competitive research centers.** Consequently, they are underrepresented in international higher education rankings: in the 2022 QS University Rankings for Emerging Europe and Central Asia, there are only two universities from Kyrgyzstan, four universities from Uzbekistan, one university from Tajikistan and 31 universities from Kazakhstan. The deep division between universities and research institutes, a heritage from the Soviet higher education system, further contributes to this challenge. In fact, indicators related to international relevance of research centers in the region are at zero or nearly zero.

Moreover, the majority of higher education institutions have poorly equipped libraries, including a lack of subscription to international research databases and a deficit of advanced laboratory equipment.

- **An outdated model for training new scientific personnel further exacerbates these issues.** While the global average number of scientists per million people has consistently increased over the last decades, it remained unchanged in Central Asia. In fact, there are even shortages of scientists and researchers in some key fields, such as sciences and technologies. On top of this, the low levels of research skills, as well as in English proficiency, among university staff limits the opportunities for scientific research and international cooperation opportunities. Critically, many researchers have a limited knowledge of the ethical norms associated with research: unethical practices, such as publication in predatory journals, are widespread, and higher education institutions are struggling to ensure the practice of ethical standards in research.
- **Insufficient investments in R&D by industry, as well as a regional economy geared towards the export of commodities, also contribute to the limited demand for university research.** Recent data shows that, while business accounts for more than 40% of R&D expenditures in Kazakhstan and in Uzbekistan, this figure is close to one-third in Kyrgyzstan, and in Tajikistan, almost all expenditures are borne by the public sector. Additionally, there is a lack of technology transfer capacity in universities, including shortages of dedicated specialists, limited instruments to support science commercialization, and the absence of incentives for researchers to engage in technology transfer activities. Thus, in 2019, Central Asia accounted for only 0.06% of the global number of patent applications and 0.06% of global registrations of industrial prototypes. At the same time, countries across the region are encouraging the establishment of technoparks.

Mutual distrust across Central Asian countries, insufficient harmonization of degrees and qualifications, and underutilized potential for intra-regional faculty, students, and labor mobility are key challenges to greater regional cooperation in Central Asia.

- **There is little trust between countries and universities in the region.** This is caused by the lack of aligned and common strategic visions for the development of higher education systems in Central Asia, but also poor awareness of collaboration opportunities and ineffective mechanisms for cooperation. Moreover, because of the absence of transparent quality assurance systems, both at the national and international levels, universities usually look outside the region for partners in academic and research projects. In fact, regional research centers have a poor reputation and are rarely considered as potential partners for joint research projects at the regional level. Furthermore, the scarcity of objective information on both weaknesses and strengths of higher education systems in the region leads to low interest in regional cooperation.
- **Despite efforts to simplify procedures for the recognition of academic credentials and qualifications, opportunities for mutual recognition of learning outcomes and academic achievements are limited.** A key constraint to the integration of Central Asian higher education systems is the lack of a framework for the standardization across programs including curricula, qualifications awarded, or teaching load. Thus, important differences between countries still exist. While Central Asian countries are progressively adopting the European Credit Transfer and Accumulation System the implementation of a credit-modular system has only minimally expanded opportunities for flexible educational trajectories within the region.
- **Central Asian countries are promoting internationalization, but do not benefit sufficiently from it and retain a net mobility deficit.** In terms of student mobility, Kazakhstan and especially Kyrgyzstan have consistently increased inbound student mobility and demonstrated high growth rates in the share of foreign students in their higher education systems. Meanwhile, Tajikistan and Uzbekistan have lower levels of internationalization than global averages and have not been increasing inbound student mobility recently. Yet, all countries in the region, except Kyrgyzstan, have a mobility deficit, losing their talents more than attracting from outside. At the same time, internationalization efforts have been focused on the provision of cheap higher education for neighboring countries, rather than prioritizing the quality of education and talent acquisition. The lack of mechanisms to support the mobility of students and faculty, as well as language barriers, constrain the region's ability to compete for talent on a global scale.

Funding and management capacity are the most significant obstacles which are fundamental to teaching, R&D and regional cooperation. The region has insufficient funding for higher education and

one the lowest level of research funding in the world, accounting for only about 0.12% of GDP and far below the levels of lower middle-income countries (0.53% in 2017). The funding structure of higher education is not well diversified: research relies heavily on public resources, which are often not results-oriented, universities lack funds for strategic investments and capital expenditures, and limited funding is dispersed between research institutes and HEIs without transparent rules of competition. Moreover, Central Asian universities often lack the autonomy to decide on their curricula, leadership, or financial resources – which significantly impacts their agility and adaptability. Meanwhile, according to expert focus groups, university managers in the region lack the managerial skills and competencies needed for effective management of HEIs. Instruments for evidence-based decision-making are not widespread due to limited capacity and experience in data collection, analysis, quality assurance, and transparency.

The proposed Roadmap recommendations aim to address these national challenges through regional integration and collaborative solutions between Central Asian countries. The Roadmap emphasizes challenges in higher education that are common to Central Asian countries and that can be more effectively tackled at a regional level rather than at the individual country level. As such, it proposes mainly solutions involving regional integration and collaboration to address these obstacles and allow for synergies between Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, enabling greater impact and benefits. Thus, the Roadmap aims to nurture the development of national higher education systems by promoting a common vision and harmonized higher education mechanisms across the region. The Roadmap recommendations were developed in close alignment with national priorities in higher education, as expressed in each country’s strategic documents. The implementation of the recommendations is expected to contribute to addressing key socio-economic challenges in the region, including reducing brain drain, enhancing labor productivity and human capital efficiency, responding to demographic pressure, and facilitating a new model of economic growth.

As such, the objectives of the Roadmap are to:

- Establish an integrated learning, research and innovation space in Central Asia and strengthening regional cross-country cooperation in higher education to address common problems and improve the region’s global positioning.
- Improve the quality and relevance of higher education in Central Asia to develop human capital to better respond to the future needs of the regional economy.
- Ensure equal opportunities for Central Asian citizens to access higher education and achieve their full economic and social potential.
- Develop competitive research capacity in higher education institutions to improve the quality of teaching and increase research productivity in the higher education sector.
- Increase the contribution of higher education systems to the development of new economic sectors with high-value added, the dissemination of technological development to the private sector, and the promotion of innovations in social sectors.

This Report primarily concentrates on higher education and its core missions, namely training human capital, generating knowledge, and translating it in technology and innovation. The analysis and recommendations proposed in the Report cover primarily the higher education system, namely educational organizations providing long-cycle bachelor’s degrees (ISCED 6) and master’s and specialist degrees (ISCED 7). The analysis and recommendations relating to research, innovation, and post-graduate degrees (ISCED 8) focus on HEIs, primarily universities. This refers to both basic and applied research, as well as technology transfer activities conducted by the higher education sector. The analysis and recommendations primarily cover Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The Report also considers the potential inclusion of Turkmenistan in subsequent stages of implementation of strategic priorities.

The Roadmap recommendations are organized around three priority policy areas:

- I. Improving access, quality, and relevance of higher education.
- II. Strengthening research and innovation capacity.
- III. Advancing instruments for an integrated regional higher education area.

Priority Policy Area I focuses on improving the quality of higher education, including external and internal quality assurance, enhancing the effectiveness and quality of teaching, increasing access and participation in higher education, and ensuring the relevance of higher education to labor market needs. To improve the quality of higher education, it is necessary to increase the attractiveness and effectiveness of teaching and to establish effective instruments of independent external accreditation, both at the national and at the regional levels, and comprehensive internal assurance mechanisms. Increasing access to higher education will promote both the development of human capital and reduce social inequality, while increasing the relevance of higher education requires closer linkages between businesses and universities to anticipate future skill needs, reduce skill mismatches, and modernize education curricula for key economic sectors in the region.

Recommendations under Priority Policy Area I include:

- Developing an effective quality assurance system, transitioning to regional external accreditation, including the establishment of regional quality standards and a regional accreditation agency, and promoting the adoption of comprehensive internal quality assurance tools.
- Improving the quality of teaching through changes in classroom teaching loads, introducing financial performance-based incentives, while also expanding opportunities for continuous professional development of teaching staff.
- Highlighting equity in higher education policy through regular monitoring at the regional level and including social indicators into funding formulas, scholarships, targeted admissions, and education loans.
- Developing distance education using regional solutions to increase higher education enrollment, reduce regional disparities in access, and decrease teaching staff's workload.
- Developing green, soft, and digital skills, labor market forecasting and graduate tracking systems at the regional level and prioritizing regional cooperation in developing higher education programs aligned with future skill needs.
- Launching a regional cooperation platform for universities and the industry.

Priority Policy Area II highlights three strategic pillars: increasing the research productivity of the academic staff in the sector, strengthening the research and innovation capacity of higher education institutions, strengthening linkages between universities and industry, and fostering excellence and collaboration between universities. Increasing the average level of research productivity needs to be achieved through increased requirements for publishing, including through stronger outcome orientation of research, along with the acquisition of research skills among university staff and enhancing publication infrastructure. Strengthening research capacity, increasing the efficiency of funding allocation through greater competition between institutions, facilitating cooperation between academic institutes and universities, completing the transition to the Ph.D. model. To promote technology transfer, it is essential to integrate university research into emerging national innovation ecosystems, while reinforcing connections between universities and industry. Finally, fostering collaboration between higher education institutions through centers of excellence are crucial to develop research capacity in the region's priority areas, but also academic excellence.

Recommendations under Priority Policy Area II include:

- Establishing financial and non-financial incentives for university staff to increase the quantity and quality of publications and take an active role in technology transfer.
- Promoting Central Asian academic journals on priority topics in international citation databases.
- Establishing networks of centers of excellence to promote collaboration between higher education institutions and stimulate research and academic excellence in priority areas of regional development, such as energy and water supply, digital agriculture and biotechnologies, green economy, and environmental management technologies.
- Launching a Central Asian Regional Research fund and increasing competitive funding for research.
- Facilitating collaboration between universities, sectoral research institutes, and non-university research centers across Central Asia, including through coordinated research programs, joint dissertation councils, and academic journals.

- Developing new incentives and instruments for industry and university cooperation at the regional level, as well as integrating universities into emerging national and regional innovation ecosystems.

Priority Policy Area III aims to establish a regional cooperation framework, harmonize the higher education space, and enhance internationalization and intra-regional mobility. To achieve this, it is essential to start by aligning national strategic priorities in the higher education sectors, establishing policy and institutional infrastructure to promote regionalization, and establishing communication platforms to promote regional cooperation between countries and universities in Central Asia. Harmonizing the educational space implies the creation of regional frameworks and developing specific instruments for the recognition of learning outcomes, including digital infrastructure for the identification of students and their academic achievements. Finally, enhancing intra-regional academic mobility can contribute to the development of a more integrated labor market and increase labor mobility.

Recommendations under Priority Policy Area III include:

- Adopting a common strategy for higher education development in Central Asia.
- Establishing policy and institutional infrastructure for regional integration of higher education within the framework of the Turkestan Declaration.
- Launching a Central Asian Short-Term Mobility Program for students and researchers.
- Supporting strategic partnerships between universities in the region, including opening university branches and launching dual-degree programs.
- Developing effective instruments for harmonizing the educational space, including the mutual recognition of learning outcomes through the European Credit Transfer and Accumulation System (ECTS) and launching digital IDs for students and researchers in Central Asia.

To effectively implement the Roadmap recommendations, long-term systemic efforts at the national level are required to achieve favorable financing and governance in the countries. Public and private funding for higher education, research, and innovation needs to be gradually increased to reach global average levels, and countries need to develop efficient funding formulas. It is essential to enhance universities' managerial capacity and financial and academic autonomy, to enable them to respond to changing realities and provide quality education to their students. Finally, national authorities need to further develop digital university infrastructure, and information systems with reliable and quality data. Key recommendations for higher education systems across the region are summarized in the Table below.

Key policy recommendations for the development of higher education in Central Asia

Strategic Pillars	Key Policy Recommendations
Priority Policy Area I. Improving access, quality, and relevance of higher education	
Pillar 1.1: Ensuring external and internal quality assurance	<ul style="list-style-type: none"> • Develop regional accreditation standards • Promote effective internal quality assurance tools • Establish the Central Asian Accreditation Agency • Increase the attractiveness and effectiveness of the teaching profession • Account for social indicators in funding formulas and loans for higher education • Promote distance/virtual higher education • Forecast regional labor market; establishing graduates tracking systems; developing green and digital skills • Develop regional cooperation platform for universities and the industry
Pillar 1.2: Enhancing the effectiveness and the quality of teaching	
Pillar 1.3: Widening participation and access to higher education	
Pillar 1.4: Ensuring the relevance of higher education	
Priority Policy Area II. Strengthening research and innovation capacity	
Pillar 2.1: Increasing research productivity of academic staff	<ul style="list-style-type: none"> • Providing financial and non-financial incentives to conduct and publish quality research results • Strengthening publication infrastructure • Establishing a network of centers of excellence in priority areas for economic development • Launching a regional competitive fund to support research and cooperation between HEIs and research institutes • Modernizing scientific personnel training, with the full implementation of the Ph.D. model • Expanding technology transfer and integrating universities in emerging national innovation ecosystems • Developing new cooperation formats and incentives for industry and universities
Pillar 2.2: Building research capacity and excellence in higher education institutions	
Pillar 2.3: Strengthening linkages between universities and industry	
Priority Policy Area III. Advancing instruments for an integrated regional higher education area	
Pillar 3.1: Establishing regional cooperation infrastructure	<ul style="list-style-type: none"> • Aligning strategic priorities of higher education development among Central Asian countries. • Establishing a regional institutional framework: Central Asian Higher Education Council, Central Asian Regional Center for Higher Education and Skills, Association of Leading Universities of Central Asia. • Developing a Central Asian Short-Term Mobility Program • Developing effective mechanisms for the recognition of academic credentials, scientific degrees, and learning outcomes across Central Asian countries
Pillar 3.2: Harmonizing the higher education space	
Pillar 3.3: Enhancing internationalization and intra-regional mobility	

In the long term, the implementation of the Roadmap recommendations will foster socioeconomic development in Central Asia. In addition to improving the quality of academic programs and research, expanded cooperation between countries can help alleviate key challenges faced by Central Asian countries. For instance, the development of higher education can help tackle demographic pressure by promoting job creation, ultimately limiting brain drain and instead promoting the circulation of talent. Moreover, expanded cooperation will help Central Asia to improve its position in the global scientific research space and improve opportunities for cooperation and regional activities across sectors, within Central Asia, but also beyond. Finally, and most importantly, the integration of higher education systems will enable Central Asian countries to move closer to the technological frontier and transition from extractive industries to science-driven sectors and a knowledge-based economy.

Introduction

Over the last decades, regionalization processes in the higher education sector have experienced exponential growth across the world. These initiatives became one of the most effective instruments for coordinating common higher education responses to shared cross-border challenges. The Bologna Process, which aimed to establish a European Higher Education Area, was one of the key drivers and benchmarks regionalization efforts. Broadly building on the experience of the Bologna Process, other higher education integration projects have been launched in Europe, South America, Southeast Asia, and South and Eastern Africa. For example, the ASEAN University Network (AUN) was established in 2003, the African Union Strategy for Harmonization of Higher Education Programmes has been developed in 2007 and a large-scale initiative for higher education regionalization in Latin America and the Caribbean (ENLACES) has been launched in 2008.

Despite common challenges and opportunities, Central Asian education systems have not followed the global trend towards higher education regionalization. Central Asian higher education systems, once part of a unified space under the Soviet regime, followed their own trajectories and developed unique attributes since their independence. At the same time, these systems still face similar challenges, such as limited funding, outdated curricula, and inadequate infrastructure, as well as common opportunities to enhance the quality and relevance of higher education and research. In fact, despite different levels of higher education development, all Central Asian countries would benefit from promoting research collaboration, developing strong innovation systems, and stimulating internationalization in the sector. While a single university in Central Asia may lack the resources to achieve global competitiveness, higher education institutions (HEIs) can improve the quality of their educational and research programs through collaborative efforts. As such, greater cooperation and coordination among countries could facilitate complementarity, specialization, and economies of scale – not only within the higher education sector but also beyond.

Integration in higher education can act as a catalyst for broader integration across economic and social sectors. Through cross-border collaboration, universities facilitate the circulation of innovative ideas between countries, leading to the development of new technologies that can benefit the entire region. This, in turn, could stimulate the establishment of new industries, create economic opportunities, and generate employment, thereby contributing to overall regional development. Moreover, the integration of higher education systems can contribute to securing the supply of specialized human capital, with deep sectoral knowledge and expertise, which is a critical enabler of future integration initiatives in other sectors. These skilled professionals play a pivotal role in facilitating the exchange of knowledge and ideas, overcoming cultural and language barriers, and fostering cross-border cooperation to tackle Central Asia's developmental challenges.

In recognition of this potential, there has been a growing focus on higher education regionalization initiatives in Central Asia in recent years. In 2017, following the ministerial meeting between countries of European Union and Central Asia, the Astana Declaration formalized the importance of cooperation in modernizing higher education and vocational education systems. Building upon this progress, another significant step was made in 2021, when the Turkestan Declaration was signed by Kazakhstan, Kyrgyzstan, Turkmenistan, and Uzbekistan, confirming the shared goal of establishing the Central Asian Higher Education Area. With these initiatives, Central Asian countries acknowledge their common history, tradition of cooperation, but also mutual objective of improving the quality of higher education while providing opportunities for their citizens. Critically, this also highlights a shared understanding of the potential for regional cooperation in higher education among Central Asian countries to enhance the international competitiveness of national higher education systems.

This Report demonstrates that the regional integration of higher education systems in Central Asia can help address challenges at the national level. To achieve this, this Report presents a comprehensive set of recommendations organized into a Roadmap to improve the quality and relevance of higher education, research, and innovation in Central Asia through the promotion of cooperation between countries and the establishment of an integrated higher education and research space at the regional level. The analysis and the Roadmap presented in this Report cover four Central Asian countries, namely Kazakhstan,

Kyrgyzstan, Tajikistan and Uzbekistan.¹ The Report also considers the potential inclusion of Turkmenistan in subsequent stages of implementation of strategic priorities.

The recommendations presented in this Report aim to tackle common challenges across Central Asia that can be more effectively addressed through regional collaboration rather than individual country efforts. The objective of these recommendations is to improve access to and quality of higher education in the region, to develop research capacity that can compete on a global scale, and to enhance the contribution of higher education to emerging national innovation ecosystems. Moreover, concrete proposals are outlined to create regional bodies to facilitate cooperation in higher education as well as specific activities for collaboration between countries and universities. These initiatives are aligned with current efforts of the Central Asian countries to increase educational attainment levels, promote economic growth, and job creation, and improve cultural, social and economic integration within the region. As such, creating an integrated educational area can help the region to become more resilient, sustainable and accelerate its overall growth.

This Report primarily concentrates on higher education systems and their core missions, namely training human capital, generating knowledge, and translating it into technology and innovation. Higher education systems refer to the educational organizations providing long-cycle bachelor's degrees (ISCED 6) and master's and specialist degrees (ISCED 7), which are the focus of the analyses and recommendations. The analysis and recommendations relating to research, innovation, and post-graduate degrees (ISCED 8) focus on HEIs, primarily universities. This refers to both basic and applied research, as well as technology transfer activities conducted by universities independently or in partnership with other academic and research organizations and businesses. Therefore, the proposed recommendations focus on research and innovation within the higher education system but build on the capabilities and limitations of national innovation ecosystems, including non-university research centers, institutes of national academies of science, innovation clusters and enterprises.

This Report is organized as follows. Section I offers an overview of the socio-economic context and government policies in the higher education sector in Central Asia. Section II outlines a strategic vision for the integration and development of higher education in Central Asia, highlighting the strategic pillars within the chosen priority policy areas. Section III describes common challenges and opportunities for Central Asian higher education systems, which serve as the focal points for the recommendations proposed in this Report. Section IV provides a detailed description of recommended actions at national and regional levels and presents the Roadmap summarizing the proposed recommendations.

¹ Unless otherwise indicated in the text, the terms “the region” or “Central Asia” in this document mean the above-specified four countries.

I. Fostering Higher Education Development in Central Asia

Regional Socio-economic Context

In the last decades, Central Asian countries have undergone significant changes. Although they may share similar features, every country in the region has its own, different strengths and weaknesses, as well as economic and social contexts.

- **Kazakhstan** is the largest economy in the region – its GDP is higher than the aggregate GDPs of all other Central Asian countries. Economic growth in the country has largely been driven by the increase in oil and gas exploration over the last decade, as well as by investments in human capital development and technologies. Kazakhstan holds 8% of the world's iron ore reserves, a quarter of the world's uranium reserves, about 3% of oil reserves and 1% of natural gas reserves. The country is also one of the main wheat producers in the region.²
- **Kyrgyzstan** is one of the most open economies in the world, and rapidly integrates in the global economy. The country has witnessed the expansion of the service sector, especially in trade and telecommunications, which compensated for the decreasing manufacturing sector. Domestic demand, as well as the growth of industrial production, hospitality sector, trade, and logistics, are well maintained. A notable increase in real salaries is observed in the country – such increase is driven by increasing salaries for public sector employees and high demand for qualified labor.
- **Tajikistan** moved from the low-income country group to the group of lower-middle income economies in the middle of 2010s. This is a significant milestone, given its weak economic position when it gained independence and consequences of a devastating civil war. Key export items include aluminum and cotton, combined with the potential of developing hydro energy.³ Currently, people under 30 account for two thirds of the population in Tajikistan⁴ – this young population represents a significant potential for future economic development.
- **Uzbekistan** maintains a stable GDP growth based on the exports of mineral resources, such as gas, uranium and gold, as well as export of agricultural products. The country is among the top 3 leading global cotton producers and exporters, and it has the fourth largest gold reserves in the world. Uzbekistan continues to demonstrate high economic growth rates due to its large workforce, extensive domestic market, diversified manufacturing capacity and progressive implementation of market reforms.⁵ Since 2016, the country has started complex economic transformations towards an open, export-oriented and private-sector-oriented economy.

Central Asian countries need a resilient growth model that can withstand external economic shocks.

Exports of minerals and workforce, including inflow of remittances from labor migrants, remain the key drivers of economic growth in the region. At the same time, countries are gradually moving away from their agricultural specialization, but the manufacturing industry accounts for only 15% of the region's GDP (Figure B.2). The state dominates the economy, especially in the key commodity markets. As such, opportunities for private initiatives and for attracting private investments, including foreign direct investments, are far from optimal. Despite improvements in the business climate, small and medium enterprises usually operate in the informal sector, and do not have strong export potential and limited innovation activities.

Central Asian countries need to diversify their economies and gradually reduce their dependence on extractive industries. Although they have been able to sustain economic growth that outpaced global averages over the last 20 years (Figure B.1), growth rates in Central Asia are slowing down. In order to keep growing, Central Asian economies should prioritize the expansion of sectors associated with high value-added goods and services. This will require the formation of highly qualified professionals and

² Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

³ EBRD (2022). Business resilience in the pandemic and beyond: Adaptation, innovation, financing and climate action from Eastern Europe to Central Asia. URL: https://www.beeps-ebd.com/wp-content/uploads/2022/05/east_es_report.pdf

⁴ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

⁵ EBRD (2022). A Cold Winter Ahead? Confronting the energy crunch. URL: <https://www.ebrd.com/regional-economic-prospects-overview-september-2022.pdf>

increasing the productivity of the current stock of human capital. Finally, the contribution of small and medium enterprises in the total factor productivity of Central Asian economies should be enhanced as well.

Central Asia has the potential to improve its global economic position. While Central Asian countries are making efforts to integrate into the global economy, they are largely isolated from other centers of economic activity, with Russia and China remaining their primary trade partners. Moreover, Kazakhstan alone accounts for more than half of Central Asian exports. Yet, the share of trade volume of between Central Asian countries remains below 10%.⁶ At the same time, foreign trade balance started to decrease in recent years⁷ and the share of services accounts for only one tenth of total foreign trade turnover.⁸ The region's reliance on foreign markets and commodities limits its ability to diversify national economies, and ultimately generates challenges for Central Asia to export to new regions.

Central Asian countries need to increase the technological and innovation intensity of their economies. Since 1996, economic activity in the region has shifted towards sectors with lower export orientation and labor productivity. Large state-owned enterprises, due to their specialization in commodities exports, have limited demand for innovation in their production processes and struggle to adapt to foreign technologies. There are insufficient numbers of medium and small enterprises that could drive innovations, and universities lack the capacity to stimulate and promote technology transfer. As a result, the region's imports of high-technology products significantly outweigh the export.⁹

Central Asia is especially vulnerable to climate change risks and urgently needs to adopt sustainable development principles. Two decades of rapid economic growth have resulted in growing demand for electricity in Central Asia and a corresponding increase in carbon dioxide emissions. At the same time, the region remains one of the most carbon intensive and vulnerable to climate change in the world, in particular when it comes to water resources, energy and food security, and environmental pollution. However, the region also holds immense potential for renewable energy development, which could function as the backbone of a green economy. Developing a green economy in Central Asia will require a concerted effort between countries of the region to reduce reliance on fossil fuels.

Central Asia also faces demographic pressures that are likely to exacerbate brain drain. With one of the youngest populations in the world, Central Asia's annual demographic growth rate is projected to be 1.1% until 2040, with the share of the 15–24-year-old cohort – a key demographic for the tertiary education system – expected to increase by 30-60% until 2030 (Figure B.4). These trends will place significant pressure on higher education systems, especially in the next 5 years, creating challenges regarding access, but also opportunities for human capital formation. All Central Asian countries have negative net migration, with the emigration of highly skilled professionals posing a particular challenge. However, mobility within the region remains limited, with intra-Central Asia migration accounting for only one tenth of the total emigration in the region.

The region has successfully improved its human capital, but challenges remain ahead. Over the last decade, Central Asia has progressively improved its human capital stock by implementing decisive measures in education, health, and social protection.¹⁰ However, while countries of the region have relatively high school life expectancies, their tertiary education enrollment rates lag behind those of global leaders. In addition, despite a high demand for highly qualified professionals, there are important labor market imbalances with employers regularly reporting shortages of skilled workers. To fully realize the potential of its human capital, Central Asia must improve the contribution of education to economic productivity, it is significantly behind European countries in this regard.¹¹

Poverty and unemployment remain a significant challenge for Central Asia. Youth unemployment is a major issue in Central Asian countries, except for Kazakhstan to some extent. Indeed, a significant share

⁶ *The Economy of Central Asia: A Fresh Perspective*. Reports and Working Papers 22/3. Almaty, Bishkek, Moscow: Eurasian Development Bank

⁷ According to the data from the World Bank database

⁸ World Integrated Trade Solutions. Trade Statistics by Country/Region. URL: <https://wits.worldbank.org/countrystats.aspx?lang=en>

⁹ World Bank. High-technology exports (% of manufactured exports). URL: <https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS>

¹⁰ UN Development Programme. Human Development Index. URL: <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>

¹¹ Demirgüç-Kunt, A., & Torre, I. (2020). Measuring human capital in Europe and Central Asia. World Bank Policy Research Working Paper, (9458).

of young people is not in employment, education, or training in the region.¹² Moreover, more than a third of the employed population has non-standard employment, which is higher than in many other regions of the world.¹³ The weak development of the private sector, combined with demographic growth, led to insufficient job creation compared to the population increase, which will likely foster labor migration. Despite notable achievements in recent years, poverty remains a critical issue for the region, with GDP per capita at purchasing power parity several times lower than in Central European and Baltic states. While the Gini coefficient suggests an average level of inequality, significant social and economic inequality persists across the region. More detailed analysis of socio-economic context of the region is presented in Annex B.

Higher Education Sector Overview

Similar changes took place across Central Asian higher education systems during the period of post-Soviet transformation. International organizations and programs, such as the World Bank, the Asian Development Bank, Erasmus+ and others, have played an important role in transforming Central Asian higher education systems. Moreover, while Kazakhstan is the only official member of the Bologna Process, the European Higher Education Area has had the largest impact on the region, with Kyrgyzstan, Tajikistan and Uzbekistan adopting some of the Bologna Principles as well. This includes the progressive transition to a three-cycle higher education system consisting of bachelor's, master's and doctoral (Ph.D.) studies, the introduction of external and internal quality assurance system, as well as the gradual introduction of credit-modular system.

The expansion of higher education has had a profound effect on the higher education sector in Central Asia, especially when it comes to access to university. After the fall of the Soviet Union, the expansion of university networks and massification of the sector took place in most of the newly independent countries, including in Central Asia. Market mechanisms were introduced, while the number of private universities increased.¹⁴ Standardized testing emerged as the main university admission mechanism, as a method to fight corruption and increase transparency. At the same time, this process has involved the transition to a dual-track funding system in public HEIs, where one group of students pays full tuition fees, while another group receives almost full-funding from the governments' budget (see Table A.1). Indeed, government scholarships in most countries cover the full or a major portion of tuition fees. However, tuition fees are high, accounting for 15-20% of annual per capita income on average across the region.¹⁵ Today, around two thirds of students at public universities in Central Asia pay tuition fees for their higher education.¹⁶

Central Asian higher education systems consist of more than 430 universities. There are more than 1.8 million university students (ISCED 6-7) and more than 1 million vocational education students (ISCED 5) in the tertiary education system. Meanwhile, share of master's students in Central Asia does not exceed 10%, except for Kyrgyzstan (see Table 1.1). One critical issue facing national higher education systems is the insufficient funding of HEIs, which is extremely low compared to other regions and leading to significant staff and infrastructure deficits. The growing demographic pressure is pushing the higher education sector to expand, but the current funding is inadequate to support such a large university network, which compromises the quality of education in the context of underdeveloped quality assurance mechanisms.

Central Asian countries are lagging behind on all global research efficiency indicators, and the contribution of industry to technological development is low. This can be in part attributed to the functional separation between the national academies of science (with a research mission) and HEIs (with an education mission) inherited from the Soviet Union, which is still prevalent in Central Asia. As a result, universities are largely excluded from the process of developing new technologies and innovations, which undermines the development of innovation in the economy, hinders the use of research results in

¹² World Bank. Share of youth not in education, employment or training, total (% of youth population). URL:

¹³ Apella, I., & Zunino, G. (2018). Nonstandard Forms of Employment in Developing Countries: A Study for a Set of Selected Countries in Latin America and the Caribbean and Europe and Central Asia. World Bank Policy Research Working Paper, (8581).

¹⁴ Huisman, J., Smolentseva, A., & Froumin, I. (2018). 25 years of transformations of higher education systems in post-Soviet countries: Reform and continuity. Springer Nature.

¹⁵ Authors' estimates based on the data in Table A1 and national statistical data.

¹⁶ Smolentseva, A. (2020). Marketisation of higher education and dual-track tuition fee system in post-Soviet countries. International Journal of Educational Development, 78, 102265.

educational processes, and limits the engagement of higher education students into research activities at universities. Despite these challenges, national higher education systems include a variety of HEIs, with multi-disciplinary classic public and private universities, small private institutes, and sectoral research institutes, which are a heritage of the Soviet system.¹⁷

The lack of autonomy for universities in Central Asia limits their ability to respond effectively to the needs of the economy. A common feature for most Central Asian countries is the preservation of centralized university management mechanisms. Usually, line Ministries play a key role in developing quality standards, investment priorities, appointing university managerial staff, and allocating resources across the higher education sector. However, this approach constrains the transformation of curricula and teaching practices, leading to insufficient attention to new skills and poor educational infrastructure. Moreover, strict government control over curricula and quasi-central planning of labor resources further exacerbates the issue. Moreover, the modernization of management systems and improvements of university performance are also hindered by nepotism and corruption.¹⁸

Current higher education development priorities in Central Asia, as outlined in national strategic documents, are largely similar. Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan have recently adopted national strategies for the development of the higher education sector. These documents put forward similar priorities, such as improving quality and access, developing science and research capacity, as well as internationalization. The countries seek to enhance quality assurance in education through the implementation of modernized accreditation systems and competitive mechanisms, while aligning graduate skills with the needs of the labor market. Most countries also prioritize continuous professional development of university staff, the implementation of innovative teaching methods, including through online education, the modernization of credit-modular systems and increasing the flexibility of the educational process. Outcome-oriented quality assurance mechanisms, such as successful graduate employment, are also being included in national strategies.

Regarding scientific research, there is a common aspiration among Central Asian countries to enhance the scientific productivity of universities. In particular, this involves improving the qualifications of staff, engaging junior researchers in scientific work, increasing funding, and creating an adequate infrastructure for technological development in priority economic sectors. Additionally, there is also a focus on improving science metrics, as well as promoting national academic journals in international research databases. Countries are also actively pursuing internationalization by attracting foreign students and participating in the global competition for top university rankings. More detailed overview of educational policy priorities of Central Asian countries is provided in the Annex B.

¹⁷ Huisman, J., Smolentseva, A., & Froumin, I. (2018). 25 years of transformations of higher education systems in post-Soviet countries: Reform and continuity. Springer Nature.

¹⁸ Chapman, D. W., & Lindner, S. (2016). Degrees of integrity: the threat of corruption in higher education. *Studies in higher education*, 41(2), 247-268.

Table 1.1. Key features of higher education systems in Central Asia, 2021-2022

	Kazakhstan	Uzbekistan	Tajikistan	Kyrgyzstan
Background data on higher education systems				
Number of HEIs	122	194*	45	73*
Including non-state	91	55*	n.a.	40*
Number of students at HEIs, in thousand	575.5	814.1	239.5	231.3*
Including full-time students, in thousand	559.7	553.9	164.7	118.8*
Part-time students, in thousand	5.9	26.5	n.a.	1.5*
Extramural students, in thousand	10.0	228	74.8	85.3*
Number of students per 10,000 people	303	229	246	355
Student composition in tertiary education, in thousand people				
ISCED 5	494.0	404.5	95.5	49.7
ISCED 6	539.0	773.6	239.5	160.0**
ISCED 7	36.5	40.4		53.7**
ISCED 8	5.9	3.9	0.22	2.6

Note: * – data is provided for 2022/2023 academic year, ** – data for 2020/2021 academic year.

Source: see footnote¹⁹

¹⁹ Kazakhstan – according to the data from the collection “Education in the Republic of Kazakhstan” (URL: <https://stat.gov.kz/edition/publication/collection>), Bureau of National statistics of the Agency for Strategic planning and reforms of the Republic of Kazakhstan (URL: <https://stat.gov.kz/official/industry/62/statistic/8>). Uzbekistan – according to the data of kun.uz portal (<https://kun.uz/uz/news/2023/02/14/ozbekistonda-talabalar-soni-1-milliondan-oshdi>), Agency of Statistics under the President of the Republic of Uzbekistan (<https://stat.uz/ru/ofitsialnaya-statistika/social-protection>), State Committee of the Republic of Uzbekistan on Statistics (<https://data.egov.uz/rus/organizations/41>). Tajikistan – according to the data from the collection “Education in the Republic of Tajikistan” (<https://stat.tj/ru/news/publications/education-in-the-republic-of-tajikistan-2021>), UNESCO (Enrollment by level of education, <http://data.uis.unesco.org/#>). Kyrgyzstan – according to the data from the collection “Kyrgyzstan in figures” (<http://www.stat.kg/media/publicationarchive/c2680694-07a1-4728-9921-131cb00e6c46.pdf>), National Statistical Committee of the Kyrgyz Republic (<http://www.stat.kg/ru/opendata/category/9/>), UNESCO (Enrollment by level of education, <http://data.uis.unesco.org/#>).

II. A Strategic Vision for Higher Education Integration in Central Asia: Why Is There a Need for Regional Cooperation?

Implementing regionalization initiatives in higher education has demonstrated a number of advantages, starting with improved economic efficiency. High enrollment rates in higher education can put a burden on state budgets, and research and development require important investments in universities. For countries that cannot afford these investments individually, regionalization projects can facilitate large-scale, resource-intensive initiatives. Moreover, functional specialization and economies of scale can generate higher aggregate outcomes than individual country investments, improving overall cost efficiency. These benefits of regional cooperation are key for Central Asian countries, given their current financial constraints and infrastructure deficits.

Second, regionalization helps balance competitive global talent market by creating new regional higher education hubs to attract highly qualified workers. The integration of higher education systems fosters mobility and provides more opportunities for studying, teaching and conducting research across the region, creating a more dynamic academic and research community. Thus, cross-country cooperation can generate a critical mass of researchers and students, fostering inbound mobility and the development of centers of excellence and world-class universities. No single country in Central Asia has sufficient domestic resources to pursue this alone, and the reputation of individual countries depends to a large extent on the overall attractiveness of the region. Therefore, only concerted efforts can lead to the development of a regional higher education hub in Central Asia.

Third, the creation of an integrated higher education and research area in Central Asia can help address crucial challenges for the region's economic development. Regional higher education integration in Central Asia has the potential to address some of the most pressing challenges facing the region's economic growth. By creating a network of universities and research centers that focus on cutting-edge research and innovation, the region can attract investment and talent in new, high-tech industries that can help to drive economic growth and the transition from extractive industries. In addition, by providing access to high-quality education and training programs, an integrated higher education area can foster the circulation of ideas and develop a skilled workforce that is better equipped to compete in the global economy. At the same time, increased availability of quality specialized human capital and research can help address common regional challenges and facilitate the growth of specific sectors.

Fourth, closer integration of Central Asian higher education systems can lead to significant improvements in quality standards and management practices. Currently, only a limited number of Central Asian universities can be considered as world-class institutions, and competition within national higher education systems remains low. Accordingly, the development of a unified higher education area in the region will foster healthy competition between institutions at a similar level of development, ultimately leading to improved performance. Moreover, through the harmonization of standards, exchange of good practices and peer-learning, HEIs in the region would ensure a more consistent, higher-quality education.

Finally, regionalization projects are an effective platform for sharing best practices and receiving support from regional leaders. On the one hand, this allows to gradually improve the average level of HEIs towards the regional leaders. Participating institutions have the opportunity to improve their management and administrative practices based on collaboration with peers, but also to improve the overall quality of research and education services. On the other hand, each country in Central Asia has its own separate strengths and best practices at national and institutional levels, which can be scaled-up in the region as a whole. Regional integration can also support the dissemination of global best through established cooperation framework for cross-country interaction and information exchange.

Objectives of the Roadmap

The proposed Roadmap recommendations aim to address national challenges through regional integration and collaborative solutions between Central Asian countries. This Report aims to demonstrate that Central Asian countries are facing common challenges in their higher education systems, but also share opportunities for the development of sector. As such, the Roadmap aims to address these common problems across Central Asia through regional cooperation and collaborative solutions: it proposes mainly solutions involving regional integration and collaboration to address these obstacles and allow for synergies between Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, enabling greater impact and

benefits. Thus, the Roadmap aims to nurture the development of national higher education systems by promoting a common vision and harmonized higher education mechanisms across the region. The Roadmap recommendations were developed in close alignment with national priorities in higher education, as expressed in each country's strategic documents. The implementation of the recommendations is expected to contribute to addressing key socio-economic challenges in the region, including reducing brain drain, enhancing labor productivity and human capital efficiency, responding to demographic pressure, and facilitating a new model of economic growth.

As such, the objectives of the Roadmap are to:

- Improving the quality and relevance of higher education in Central Asia to develop human capital to better respond to the future needs of the regional economy.
- Ensuring equal opportunities for Central Asian citizens to access higher education and achieve their full economic and social potential.
- Developing competitive research capacity in HEIs to improve the quality of teaching and increase research productivity in higher education sector.
- Increasing the contribution of higher education systems to the development of new economic sectors with high value-added, the dissemination of technological development to the private sector, and the promotion of innovations in social sectors.
- Establishing a regionally integrated area for academic programs and research in Central Asia and strengthening regional cross-country cooperation to address common problems and improve the region's global positioning.

Priority Policy Areas

The recommendations for regional collaboration put forward in the Roadmap are organized around three priority policy areas:

- I. Improving access, quality, and relevance of higher education.
- II. Strengthening research and innovation capacity.
- III. Advancing instruments for an integrated regional higher education area.

The Roadmap identifies a total of 10 strategic pillars within these three priority policy areas (see detailed description in Section IV of the Report). The pillars were selected based on two principles:

- The significant role of higher education in the social, economic, and technological development of modern societies. Therefore, these recommendations not only shape the development of higher education systems, but also address long-term challenges external to higher education (see Figure 2.1.).
- Alignment with the goals and objectives of higher education, research and innovation development as outlined in government strategic documents adopted in Central Asian countries (see Annex, Table D.1.).

Specific recommendations (see Section IV) have been developed within each strategic pillar based on the following principles:

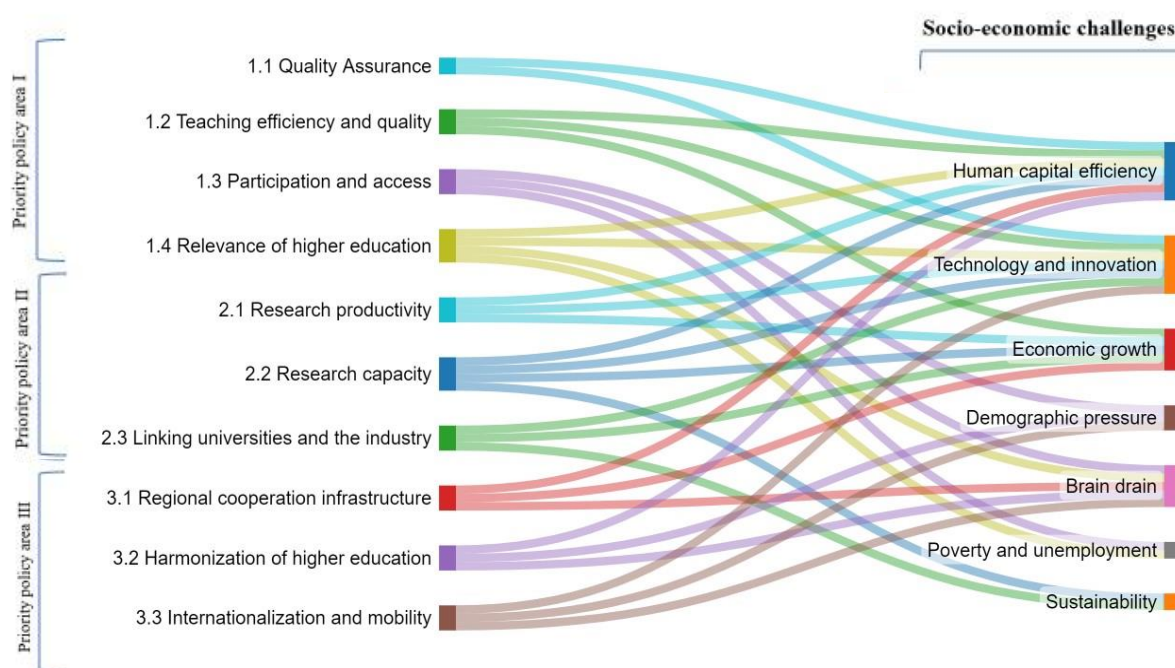
- *Addressing common problems:* Preliminary analysis of academic and expert literature identified key challenges that are common to Central Asian higher education systems. Subsequently, focus groups and cross-sectoral expert surveys were conducted in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan to further discuss challenges and identify actions. As a result, challenges relevant to at least three Central Asian countries, which can be addressed more effectively through joint efforts rather than through individual country actions, were identified and analyzed (see Section III). The suggested recommendations are focused on addressing these shared challenges.
- *Building on best practices and expert validation:* The recommendations were informed by more than 30 best practices in regional cooperation and development of higher education at the regional level collected by the World Bank team. In addition, the proposed solutions were validated through a series of expert surveys and focus groups.

- *Harnessing digital opportunities*: The suggested recommendations prioritize the optimal use of digital technologies and ensuring their interoperability to develop integrated digital learning and research environments at the regional level.

The Roadmap also outlines institutional prerequisites in governance and financing that need to be achieved in each country for the effective implementation of most strategic pillars.

The Roadmap emphasizes cross-country cooperation and is primarily addressed to national authorities. Some recommendations require intergovernmental cooperation among all or most countries, while others can be implemented at the national level, especially when it comes to establishing favorable institutional conditions, removing obstacles, investing in infrastructure, and ensuring political support. The successful implementation of the Roadmap also depends on the readiness of universities to cooperate.

Figure 2.1. Linkages between strategic pillars and socio-economic challenges



Key potential obstacles to the implementation of the Roadmap

The successful implementation of this Roadmap requires careful consideration of potential obstacles that may arise along the way. Several key obstacles have been identified that could hinder the realization of its goals. These obstacles include external economic conditions and resource constraints, development disparities between countries, lack of political integration, and misalignment among key stakeholders. By understanding and addressing these challenges, the Roadmap can be adapted and strengthened to maximize its impact and ensure the effective integration and development of higher education systems in the region.

Obstacle 1. External economic conditions and resource constraints.

Central Asia is projected to experience one of the highest economic growth rates in the next two years. However, the region’s reliance on export industries and remittances exposes it to external economic shocks. While investments in education and science yield significant economic returns, they require substantial initial funding. The COVID-19 pandemic has further strained social spending, limiting the capacity for public investment in tertiary education and technology across the region. As a result, the lack of resources is a key risk to the implementation of the proposed recommendations.

Options to address this obstacle include:

- Emphasizing the need for coordinated efforts to increase non-state funding for higher education in the countries of the region.
- Providing flexibility in possible policy solutions, considering resource constraints.

- Focusing on improving the efficiency of resource utilization and prioritize investments according to individual country plans.
- Leveraging cost-efficient digital tools to maximize resource utilization.

Obstacle 2. Development disparities between countries.

The countries in the region have followed different paths since their independence and have had uneven resources during their transitions to market economies. As a result, they find themselves at different levels of both socio-economic and higher education development. For instance, Kazakhstan is headed of other Central Asian countries for most indicators, with a GDP larger than the combined total of the other countries examined in this Report. These disparities create challenges in terms of the scale and pace of potential changes and can hinder the harmonization of interests at the regional level.

Options to address this obstacle include:

- Encouraging coordination at regional level, where common challenges can be more effectively addressed through joint efforts.
- Ensuring that the national components of the Roadmap consider the unique country context and are aligned with each country's national priorities for higher education.
- Disseminating and scaling up individual practices of excellence that each country has developed, allowing for cross-country learning and exchange of best practices.

Obstacle 3. Lack of political integration.

Most major regionalization projects in higher education have been preceded by broader political integration efforts. Given that the Central Asian countries have only recently gained independence and are still in the early stages of political collaboration, integration in higher education is relatively new. The Turkestan Declaration marked the beginning of this process, and the Roadmap is intended to intensify it. However, the effectiveness of the Roadmap's implementation will be limited if broader integration in higher education is not achieved.

Options to address this obstacle include:

- Establishing the necessary infrastructure for regional cooperation in higher education is a crucial initial step in the Roadmap.
- Recognizing that integration in higher education can serve as a significant driver for broader political integration within the region.

Obstacle 4. Misalignment among key stakeholders.

Higher education systems in the region face the challenge of building a comprehensive higher education and innovation ecosystem. The linkages between universities, research institutes and industry have been disrupted when Central Asian countries gained independence, and there is a lack of alignment between key stakeholders and HEIs' education and research outputs. The structure of the economy does not currently create a high demand from the industry for innovation or the modern skills possessed by HEI graduates. This lack of strong ownership by key stakeholders hinders the potential positive effects of implementing the Roadmap.

Options to address this obstacle include:

- Ensuring that the implementation of recommendations in the Roadmap take into consideration the interests of key stakeholders and actively engage them.
- Fostering the integration of universities into emerging national innovation ecosystems facilitating collaboration between academia and industry.
- Leveraging universities and centers of excellence as drivers for grassroots communication and cooperation, promoting active engagement and participation among stakeholders.

III. Common Challenges and Opportunities in Higher Education at National Level

This Section provides an analysis of the common challenges and opportunities of Central Asian higher education systems, as identified through experts focus groups. The section begins by examining the context where higher education systems in Central Asia evolve, focusing on challenges related to funding and university management. While these challenges are among the most significant barriers facing the region, they require long-term, systemic solutions including those that are beyond the scope of the proposed Roadmap. Nevertheless, addressing these challenges is essential for creating the necessary institutional conditions to support the successful implementation of the Roadmap recommendations (see General Institutional Prerequisites in Section IV). Then, the section describes the constraints and opportunities that are relevant to three priority policy areas: Quality, Access and Relevance of Higher Education; Research and Innovation; and Regional Cooperation.

Financing and Governance

The level of higher education and science funding does not correspond to the ambitious objectives set by Central Asian countries. Public expenditures for tertiary education account for 0.2% of GDP in Kazakhstan (2018), 0.18% in Kyrgyzstan (2017), 0.52% in Tajikistan (2015), and 0.89% in Uzbekistan (2022) (see Table A.1). In comparison, the average percentage for OECD countries is 0.9% of GDP (2019).²⁰ The scientific sector also suffers from chronic underfunding. While research and development expenditures increased by almost 20% from 2014 to 2018 worldwide, they experienced some of the fastest cuts in Central Asia.²¹ In fact, the region has the lowest level of research funding in the world, accounting for only 0.12% of GDP (Figure 3.1.), ranking just ahead of Caribbean countries. In comparison, research and development expenditures account on average for 2.6% of GDP worldwide, 1.3% of GDP in Central European and Baltic states, and 0.5% of GDP in lower-middle-income countries. The global leaders of innovative development, such as Korea and Israel, spend about 5% of GDP on R&D.²² Furthermore, funding per researcher in the region amounts to approximately US\$25,000,²³ which is significantly lower than the global average of US\$166,000, and in East Asia where it amounts to US\$193,000.²⁴ Even in Kazakhstan, the regional leader in science funding, funding per researcher equals to US\$40-50,000, which is still two times lower than the average for lower-middle income countries.²⁵

²⁰ According to the data from OECD. Stat, 2019 г. URL: <https://stats.oecd.org/>

²¹ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

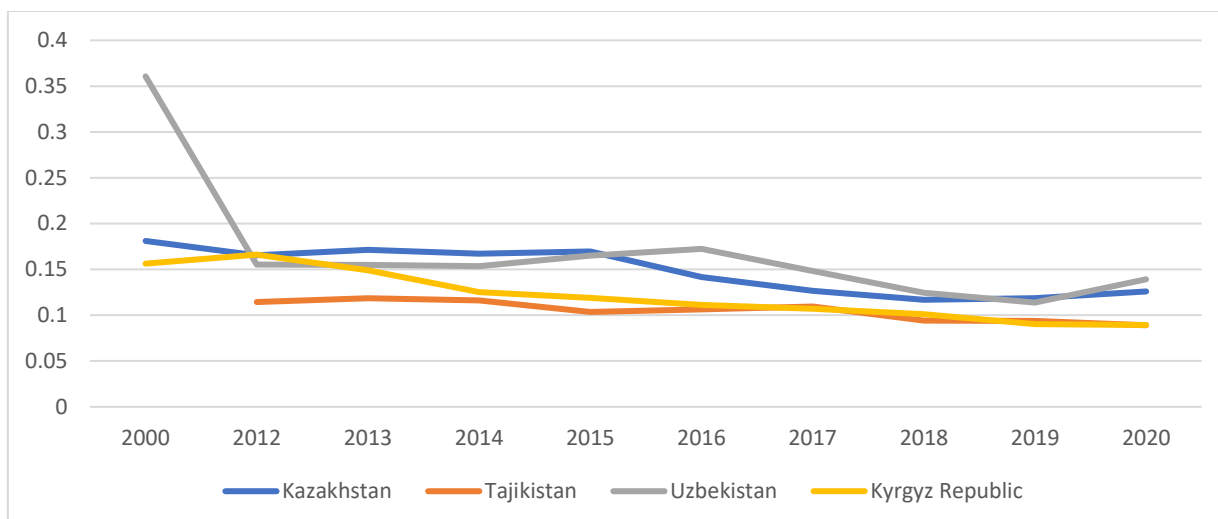
²² According to the data from UNESCO Statistics. URL: <http://data.uis.unesco.org/#>

²³ At purchasing power parity

²⁴ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing. Note: data for 2018, the indicator GERD per researcher (FTE), PPP\$ thousands.

²⁵ World Bank. 2020. Modernizing Uzbekistan National Innovation System (Munis) Project. Report No: PAD3955. Finance, Competitiveness and Innovation Global Practice - Europe and Central Asia Region. Washington, DC: World Bank. Note: according to the data for 2010-2020.

Figure 3.1. Gross research and development expenditures, % of GDP (2000-2020)



Source: World Bank. Research and development expenditure (% of GDP). URL: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>

Insufficient funding of higher education and science has a number of negative consequences. First, this leads to less competitive salaries for university staff, which limits the attractiveness of the sector and fosters the brain drain of scientific and academic personnel. Additionally, the lack of funding negatively affects equity in education by reducing investment in scholarships and other forms of financial support for students from disadvantaged backgrounds. In general, lower expenditures lead to inadequate quality of education and research, outdated infrastructure, lower qualification of academic staff, and limited resources for innovation and technology transfer. This results in limited prestige of research activities and creates substantial barriers for the countries' competitiveness in science-driven sectors of the economy.

The funding structure of higher education is poorly diversified and insufficient. The transition to a market economy led to a reduction in public expenditures for higher education and research. Thus, public funds account for a small part of university budgets, so HEIs seek to generate funds through the commercialization of educational services. Consequently, tuition fees account for the majority of university budgets: for example, HEIs in Uzbekistan generate almost 70% of their funding from tuition fees, while this figure rises up to 85-90% in Kyrgyzstan. This dual-track funding model has a negative impact on private investments and on equity. Government scholarships are often provided to more educated and better-off families that would be able to pay tuition fees for their children, leaving less opportunities for those with vulnerable economic backgrounds. Moreover, while almost all banks in the region offer educational loans, loan coverage in Central Asia remains low.

Meanwhile, the state remains the primary source of funding for scientific research and development, as private businesses provide little support. More than one-half of R&D funding in Kazakhstan is still received from the state.²⁶ The country has introduced requirements for quasi-public extractive companies to allocate 1% of their subsoil operation expenditures to R&D funding, but such financing mainly focuses on extractive-related projects and is largely allocated to affiliated companies and technoparks (78% and 15%, respectively).²⁷ In Kyrgyzstan, it was announced that starting from 2023, all ministries and state-owned companies will allocate 1% of their budget to support outstanding research and innovation projects proposed by universities. Moreover, there is little foreign investment in university R&D in Central Asia. In Kazakhstan, the share of foreign investments in R&D funding over the last years was on average 2-3%, while in Uzbekistan it has never exceeded 1%. Experts attribute the lack of foreign-funded projects to the absence of competitive research environment, research ethics and transparency in Central Asia.

Universities struggle to secure funds for strategic investments and capital expenditures. In Central Asia, the state is the key source of capital-intensive investments and university infrastructure development. However, capital expenditures remain minimal, while current expenditures for salaries account for almost

²⁶ *ibid*

²⁷ Ministry of Science and Higher Education of the Republic of Kazakhstan, National Academy of Science of the Republic of Kazakhstan. (2022). National Report on Science Almaty-Astana.

100% of the university budgets (see Table A.1). Such a focus on current expenditures does not enable HEIs to finance research or procure advanced research equipment. This situation is further compounded by the lack of regulatory and institutional framework for establishing endowment funds at universities that can generate returns on investments. In many leading universities, such returns represent key sources of R&D funding. Although some universities in the region, such as the American University in Central Asia and Nazarbayev University, have established endowment funds, these mechanisms remain underdeveloped and do not secure access to securities of pension funds, national company stocks, or international securities exchanges.

The funding of long-term research and development activities in Central Asian universities is still in its initial stages. The process from undertaking research to creating prototypes is lengthy and carries a high level of risk, while public funding is tied to short-term budget cycles of 1-2 years. Moreover, there is a significant absence of venture financing frameworks, and the lack of science-driven companies and institutional investors is aggravated by underdeveloped institutions for protecting property rights, along with high levels of corruption. Although businesses participate now more actively in funding science, the absence of substantial private investments limits opportunities for innovative development.

Public funding lacks orientation towards outcomes and competition. Experts in all countries noted during focus groups that the criteria for distributing public funding among universities remain non-transparent. While funding for different HEIs appears to be diversified, administrative teams at universities do not have clear criteria to obtain larger funding. In fact, public funding is determined based on administrative regulations, mainly related to the number of faculty members, rather than performance. Moreover, the bulk of public funding is allocated to socially important sectors or selected groups of HEIs based on state priorities. For example, in Tajikistan, public funding for higher education is primarily allocated to pedagogical programs.

Limited funding is distributed separately between research institutes and HEIs. This separation does not rely on clear criteria based on expected productivity and transparent rules for research teams' competition over these resources. It frequently happens that sectoral logic or non-transparent mechanisms for supporting some HEIs dominate the process of allocating funding for science, limiting coherence of research agendas and competition over resources. The distribution of targeted public funding for science frequently becomes a mechanism to cross-subsidize basic needs of subordinate organizations, which does not facilitate the development of advanced research. In fact, funding for scientific research is based on reporting metrics and focuses mainly on the gross number of publications, with little regard for the citation ratio. In general, time budget and financial incentives for university staff in the region are inadequate to facilitate scientific productivity. Moreover, the link between career advancement and research and educational excellence is not adequately established, both in research institutes and in HEIs.

Limited managerial autonomy of universities prevents the development of competition and grassroots initiatives. Experts highlighted excessive bureaucracy and centralization of management procedures across virtually all areas of university operations as a major issue. This applies to staff recruitment, the design of educational programs, academic mobility, educational standards, and, especially, financial decision-making. Moreover, the appointment procedures for rectors are highly centralized and politicized. Consequently, rectors of universities and research institutes often lack the autonomy to pursue results-oriented policies and to implement incentives to improve the performance of their institution. In fact, frameworks for performance-based management of universities exist only in some countries of the region. For instance, Kazakhstan and Uzbekistan have taken steps to address this issue by using performance-based mechanisms to monitor research and educational activities of HEIs, such as the number of students who graduate on time or the number of employed graduates. However, such practices are much less common in Kyrgyzstan and Tajikistan.

The lack of managerial autonomy is further compounded by the lack of financial autonomy. Although the majority of HEIs in the region obtain more than half of their funding from tuition fees, they are subject to strict regulations and restrictions regarding expenditures. Financial decisions remain extremely centralized, and even middle-level managers such as deans lack the authority or confidence to engage in financial decision-making. In Tajikistan, HEIs can allocate their own revenues to a limited range of areas, such as salaries, taxes, consumables, and utilities – subject to endorsement of cost estimates by the Ministry of Finance. In Uzbekistan, HEIs are allowed to spend up to 30% of their own revenues for incentives

provided to academic staff, including financial remunerations for scientific publications.²⁸ Moreover, in 2022, 35 HEIs obtained greater financial autonomy across a wide range of areas,²⁹ but the majority of public HEIs still operate under rigid financial regulations fixed by the state. Kazakhstan has progressively granted more financial autonomy to universities, enabling them to open subsidiaries as limited liability partnerships, and provided them with greater independence in decision-making related to internal structures, wages, and borrowing funds.³⁰ Despite these developments, experts argue that centralized control still dominates financial decision-making, leading to a lack of strategic planning in Kazakh universities. In fact, financial units of HEIs are mainly dealing with salaries and allocating teaching hours, rather than achieving financial efficiency.

Instruments for evidence-based decision-making are limited. The region faces a lack of capacity and experience in data collection, analysis, quality assurance, and transparency, which inhibits policymakers' ability to pursue evidence-based decision-making. In some cases, universities are not willing to share data with government institutions or other stakeholders because of confidentiality concerns and increased bureaucratic pressure. Nevertheless, some countries have taken steps to establish databases and information systems for decision-making in higher education. Between 2016 and 2020, Uzbekistan has introduced the "Ta'lim" information system that facilitates information exchange between educational institutions and other public organizations. In Kazakhstan, the National Educational Database (NEDB) collects relevant administrative data on a broad range of issues, with the explicit goal of verifying the outcomes of implemented reforms. However, experts indicate that data collected by the NEDB is not accessible to the general public, including HEIs.

According to expert focus groups, university managers in the region lack managerial skills and competencies needed for effective management of HEIs. This is in part related to the legacy of the Soviet system, which prioritized academic knowledge over managerial experience for university managers. As a result, many universities in the region are headed by scientists with limited management experience. The changing economic conditions, where HEIs need to have higher entrepreneurial agility and better responsiveness to the labor market needs, requires university managers to possess a wider range of skills, including strategic planning, as well as financial management and marketing skills.

²⁸ Ruziev, K., & Mamasolieva, M. (2022). Building University Research Capacity in Uzbekistan. In *Building Research Capacity at Universities: Insights from Post-Soviet Countries* (pp. 285-303). Cham: Springer International Publishing.

²⁹ According to the data from the Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan, 2022. URL: <https://edu.uz/uz/pages/sss>

³⁰ Ruziev, K., & Mamasolieva, M. (2022). Building University Research Capacity in Uzbekistan. In *Building Research Capacity at Universities: Insights from Post-Soviet Countries* (pp. 285-303). Cham: Springer International Publishing.; "Transition to University Autonomy in Kazakhstan" Report by the European University Association, 2018

Quality, Access, and Relevance of Higher Education

Promoting quality, accessibility, and industry collaboration in higher education is vital for Central Asian countries to address disparities, enhance human capital, and bridge the gap between skills supply and demand. Ensuring the quality of higher education depends on the infrastructure and quality assurance mechanisms, both within and beyond HEIs. Teaching and research staff also play a key role in promoting quality of teaching, as does ensuring that students have undergone adequate training in high school. In addition to quality, it is equally important to consider the accessibility of higher education, which serves as both a means of increasing the human capital stock and an important social mobility mechanism for population. As such, Central Asian countries should expand opportunities for ensuring higher education quality and address disparities in access. Finally, the region faces a challenging task of revitalizing linkages between HEIs and industry, including providing relevant skills and reducing structural imbalances between supply and demand in labor markets. Addressing these challenges will require a multifaceted approach that involves collaboration between governments, HEIs and industry.

Table 3.1. Key Challenges and Opportunities Regarding Quality, Access, and Relevance of Higher Education

Key Challenges	Opportunities
<ul style="list-style-type: none"> • Weak prestige of teaching profession due to the low remuneration and excessive classroom hours. • Limited staff renewal, lack of modern teaching skills, outdated infrastructure, quality of secondary education and centralized university admission negatively impact the quality of teaching. • Despite notable progress, external and especially internal quality assurance mechanisms have not produced a significant impact. • Comparatively low level of participation in higher education, combined with significant social and territorial disparities in access. • Disproportionate enrollment in academic programs misaligned with the needs of the labor market, outdated curricula and lack of graduate programs exacerbate skills mismatch. 	<ul style="list-style-type: none"> • Optimizing faculty time budget and promoting result-oriented remuneration. • More integrated and digitalized faculty recruitment at regional level. • Developing regional accreditation standards, broader adoption of independent external accreditation and internal quality assurance mechanisms. • Developing cost-efficient distance learning. • Prioritizing students' financial assistance to increase accessibility for underrepresented groups. • Forecasting skills, increasing enrolment to graduate and STEM programs, and strengthening employer engagement to reduce skills mismatch. • Modernizing curricula in programs in priority sectors and those enrolling a high number of students.

A. Quality of Teaching and Learning

Outdated learning infrastructure remains a critical and urgent challenge in Central Asian higher education systems. Many educational buildings do not meet modern requirements, including the lack of broadband internet access, which hinders the quality of education. For example, ADB's study of selected HEIs in Tajikistan indicates that campuses in many universities, including laboratories, have deteriorated due to limited investments in infrastructure renewal.³¹ The situation in Kyrgyzstan is similar, where HEIs do not have the financial resources to invest in new equipment and still rely on learning materials from the

³¹ ADB (2015). Assessment of Higher Education: Tajikistan. URL: <https://www.adb.org/sites/default/files/institutional-document/175952/higher-education-taj.pdf>

Soviet era.³² Even in Kazakhstan and Uzbekistan, HEIs use old equipment, which limits opportunities for research, especially for institutions that are not among the best in the country.³³

Remuneration in the sector is not sufficient to attract and retain highly qualified academic staff.

Limited resources and the inability to use own revenues for additional financial incentives for faculty contribute to low salaries in the sector:

- In Kazakhstan, the monthly salary of an associate professor is about US\$500, while the average monthly salary in the country is US\$600-700.
- A monthly salary of a university professor in Kyrgyzstan is US\$170-500,³⁴ while the average salary of a school teacher is US\$300.³⁵ Thus, pedagogy professors frequently leave academia to work as school teachers, where the lowest salary today can be up to two times higher.
- In Tajikistan, the monthly salary for academic staff varies between US\$200-500, depending on academic degree and rank. In comparison, the average salary in the country is US\$150-200.
- In Uzbekistan, the salary of a senior lecturer with an academic degree is about US\$530 and about US\$720 for a professor,³⁶ while the average salary in the country is about US\$250.³⁷

Financial incentives for faculty members do not have clear connections with their performance.

Usually, universities in Central Asia have to adhere to strict rules when it comes to salaries, which limit their ability to create tailored conditions for attracting qualified teaching and research staff. Standardized formulas used to calculate salaries are primarily based on the gross volume of teaching load, and poorly account for research activities and the quality of teaching. As a result, additional financial incentives to attract outstanding faculty members are not widespread and difficult to implement. For instance, public universities in Kazakhstan can make decisions on additional payments only within specified limits.³⁸ HEIs in Tajikistan can increase salaries paid from a designated account, but only if there are sufficient funds available after other mandatory expenditures designated by authorities. Universities in Kyrgyzstan can provide bonuses and other financial incentives and compensations in addition to the monthly salaries of university staff within the framework of available budget.³⁹

Selectivity in staff recruitment remains low because of the limited attractiveness of academic professions. Highly qualified candidates may opt to work in the corporate sector where they can expect better remuneration and compensation packages. As a result, some departments face a shortage of candidates when hiring for competitive faculty positions. In addition, the current centralized requirements for staff recruitment limit universities' ability to implement flexible recruitment strategies that can attract the best candidates. Furthermore, these requirements fail to incorporate international best practices for recruitment and retention of academic staff, such as the tenure track model, which offers career advancement and lifetime employment security for professors who meet key performance indicators within a specified period of time. Finally, hiring foreign academics is difficult due to limited resources and the volatility of foreign exchange rates in the region.

University staff in Central Asia are overburdened with their teaching load. The student-to-teacher ratios are relatively positive across the region, ranging from 11 to 15. In comparison, in the United States and Russia, this ratio stands at 12, or at 7 in Germany⁴⁰ However, teaching load is extremely high, often amounting to 700-900 classroom hours annually. This imbalance is caused by outdated teaching practices with a long-standing standard of classroom teaching, a large number of disciplines in each degree, and a

³² JICA (2017). Data Collection Survey on Advanced Industrial Human Resource Development in Central Asia. URL: <https://openjicareport.jica.go.jp/pdf/12321709.pdf>

³³ Ibid.

³⁴ SalaryExplorer. Lecturer Average Salary in Kyrgyzstan 2023. URL: <http://www.salaryexplorer.com/salary-survey.php?loc=116&loctype=1&job=6259&jobtype=3>

³⁵ Based on the data from National Statistical Committee of the Kyrgyz Republic

³⁶ Calculations based on the data from the Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan for 2020. URL: <https://edu.uz/uz/pages/sss> Note: translation into US\$ was made based on the exchange rate at the end of 2020.

³⁷ Agency of Statistics under the President of the Republic of Uzbekistan URL: <https://stat.uz/ru/ofitsialnaya-statistika/labor-market>

³⁸ "Transition to University Autonomy in Kazakhstan" Report by the European University Association, 2018

³⁹ European Union (2017). Overview of Higher Education System Kyrgyzstan. URL: https://erasmusplus.kg/wp-content/uploads/2018/02/countryfiche_kyrgyzstan_201-7_rus.pdf

⁴⁰ World Bank. Pupil-teacher ratio, tertiary. URL: <https://data.worldbank.org/indicator/SE.TER.ENRL.TC.ZS>. Note: data for 2017-2019 were used.

large number of specializations offered by each individual university with low numbers of students per specialization. Moreover, because of low salaries, it was reported that faculty members sometimes work at several universities simultaneously, which negatively affects the quality of education.

The growing age of faculty in the region is a problem, and there is a lack of junior researchers to support competitive human resources policies. The academic workforce in Central Asian universities is aging rapidly. For example, in Kazakh HEIs, only 36% of professors are below the age of 39,⁴¹ while in Tajikistan, only 10% of professors with academic degrees are below the age of 35.⁴² This can negatively impact the quality of education, because of the higher risk of knowledge and skills obsolescence in this age group, but also limits the diversity of faculty members. This low proportion of junior scientists could also be attributed to brain drain, particularly migration that occurred after the Central Asian countries gained independence. At the same time, the share of postgraduate/Ph.D. students (ISCED 8) in the region ranges from 0.5% to 1.2% of the total number of students,⁴³ which is substantially lower than in other countries. In comparison, in Germany, Estonia, Bulgaria and Latvia, this figure fluctuates between 2.6% and 5.6%.⁴⁴

Faculty members in Central Asia lack adequate scientific qualifications. The majority of faculty does not have a Ph.D. or equivalent academic degree, which limits the quality of teaching, as well as the innovation capacity of universities in Central Asia. In fact, only about one third of professors have Ph.D. degrees or equivalent in Tajikistan⁴⁵ and Kyrgyzstan.⁴⁶ In Uzbekistan, 16.4% of professors have Candidate of Sciences degrees, 8.4% have Ph.D.s, and 5.8% have Doctor of Sciences degrees.⁴⁷ Finally, while Kazakhstan aims for 40-50% of professors to have an academic degree, this is not always enforced.⁴⁸ Insufficient scientific qualifications may result in subpar teaching quality, as educators may lack the depth of knowledge and expertise required to effectively deliver course content and engage students. Moreover, faculty members without up-to-date scientific qualifications can struggle to incorporate the latest advancements and research findings into the curriculum, leading to outdated course materials and limited exposure to current trends in the field.

In addition, faculty members lack up-to-date teaching skills and still use outdated teaching methods. Central Asian faculty often rely on outdated teaching methods focusing on passive learning approaches, such as lectures and rote memorization, over the ability to conduct research, to analyze data, and to make conclusions based on evidence, which can result in reduced student engagement and limited opportunities for active participation and critical thinking. Moreover, faculty members struggle to employ effective pedagogical techniques that promote student-centered learning and real-world application of knowledge and lack the skills to cater to diverse student needs and integrate technology in the classroom.⁴⁹ In addition, the majority of university staff do not know any foreign languages besides Russian, which substantially reduces their opportunities for maintaining the required level of knowledge in their discipline. Indeed, learning materials, especially those published in national languages, have limited coverage of subjects, are of poor quality, or are outdated.

Despite efforts aimed at improving the quality of secondary education in the region, it remains inadequate for university preparation. Insufficient funding and limited teacher training opportunities, coupled with curricular constraints, fail to equip students with the necessary knowledge and skills required for successful university studies and employment. Indeed, the Human Capital Project⁵⁰ presents standardized academic achievement test results that illustrate the quality of secondary education in Central

⁴¹ According to the data from the Bureau of National Statistics, Ministry of National Economy of the Republic of Kazakhstan.

⁴² NPICenter. (2021). Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda Dushanbe.

⁴³ According to the data from the World Bank database, 2019

⁴⁴ According to the data from the World Bank database, 2019

⁴⁵ Agency on Statistics under President of the Republic of Tajikistan. (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe

⁴⁶ According to the data from the Ministry of Education and Science of the Kyrgyz Republic, 2022.

⁴⁷ Agency of Statistics under the President of the Republic of Uzbekistan. (2022). Science and innovative activities in Uzbekistan (2018-2021). Tashkent. URL: <https://stat.uz/ru/publikatsii/6438-111111111>

⁴⁸ Order of the Minister of Education and Science of the Republic of Kazakhstan No. 391 dated June 17, 2015. *On approval of qualification requirements for educational activities of organizations that provide higher and (or) postgraduate education, and a list of documents confirming compliance with them.*

⁴⁹ Ryskulova, C. (2019). Integration into the European Higher Education Area: A New Quality Assurance System in Kyrgyzstan. Higher Education and Beyond, 1(19), 17-19. URL: https://herb.hse.ru/data/2019/04/02/1190797061/1HERB_19_view.pdf#page=17

⁵⁰ World Bank. Human Capital Project. <https://www.worldbank.org/en/publication/human-capital>

Asian countries. The tests show that Kazakhstan attained a score of 416, Uzbekistan 474, Kyrgyzstan 420, and Tajikistan 391, with a minimum score of 300 and a maximum of 580. In comparison, Estonia scored 543 and Bulgaria scored 441. These results indicate that Central Asian countries are falling behind leading countries such as Singapore (575) and Japan (549) in terms of education quality.

The centralized university admission system to higher education has been largely preserved in Central Asia. Governments determine the number of students that can be admitted by every university through centralized quotas, which may not correspond to the demand for specific programs or quality of education provided. Public authorities also set the number of students that can benefit from scholarships. However, under this model, the number of budget-funded places is insufficient, and fee-paying places are often filled with those who can afford to pay for their education, rather than those who are the most qualified. As a result, there is an institutional incentive for HEIs to retain a maximum of students that pay their tuition fees at expense of academic standards, which negatively impacts the quality of higher education.⁵¹

Extramural studies are more widespread in Central Asia than in other regions. This format of distance education enables students to obtain a degree or a diploma without attending regular classes on campus. This format allows combining both education and work and is affordable for families with lower socio-economic status. As such, a total of one third of students is enrolled in extramural programs in all countries (see Table 1.1), except for Kazakhstan, where there has been a deliberate decrease since the mid-2000s. While extramural studies have been one of the key drivers for educational expansion during the post-Soviet period, this format offers little interaction between students and HEIs, and typically have lower quality standards than full-time studies, compromising the quality of higher education.

Central Asian countries have recognized the importance of enhancing external and internal quality assurance in higher education. This was in fact outlined in both the Astana (2017) and Turkestan (2021) Declarations.

- State scholarships in Kazakhstan are provided to accredited HEIs only, that is why more than 90% of HEIs in the country have undergone independent accreditation.
- In 2016, Kyrgyzstan has implemented new accreditation standards and procedures based on the European Standards and Guidelines (ESG). Undergoing external accreditation in one of the seven independent non-government accreditation agencies has become mandatory for all colleges and universities.
- External accreditation in Tajikistan is performed by the Agency for Supervision in the Field of Education and Science under the President of the Republic of Tajikistan. With the support from the World Bank during 2020-2021, the Agency has revised the process of institutional accreditation and made it closer to the ESG principles.
- In Uzbekistan, the State Inspection Service for the Supervision of Quality in Education, established to develop external quality of education and accreditation, was dismantled in 2023. Its functions have been split among newly established Ministry of Preschool and School Education and the Ministry of Higher and Secondary Specialized Education.

Despite the formal dissemination of procedures, external accreditation has not become a meaningful instrument for improving the quality of higher education in Central Asian countries. According to experts, many universities continue to follow irrelevant and outdated quality assurance systems. Although most national agencies claim to comply with international standards, there is little effective assurance over the quality of their work. In fact, many agencies do not establish minimum adequate requirements for accreditation. Moreover, since accreditation is paid for from the limited extra-budgetary sources of HEIs, services of reputable foreign agencies remain unaffordable for most universities. As a result, external accreditation is often limited to self-assessments, which is perceived by faculty members as additional paperwork rather than a mean to improve education quality.⁵²

⁵¹ Smolentseva, A (2020) Marketisation of higher education and dual-track tuition fee system in post-Soviet countries. *International Journal of Educational Development*, 78: 1–14. DOI: 10.1016/j.ijedudev.2020.102265

⁵² Ryskulova, C. (2019). Integration into the European Higher Education Area: A New Quality Assurance System in Kyrgyzstan. *Higher Education and Beyond*, 1(19), 17-19. URL:

https://herb.hse.ru/data/2019/04/02/1190797061/1HERB_19_view.pdf#page=17

Comprehensive internal quality assurance is not common at HEIs in Central Asia. Despite the widespread adoption of international institutional and program accreditations by HEIs, only a few have developed policies for internal quality assurance. Faculty and administrative staff at universities often do not understand the importance of self-assessment and perceive internal quality assurance only as a preparation for external quality assurance. Although some universities have introduced selected instruments of internal assessment, comprehensive solutions remain rare. While all countries are moving towards closer cooperation with external stakeholders, employers are virtually absent in the system of external and internal quality assurance in higher education.

B. Access and Participation in Higher Education

Human capital in Central Asia can be enhanced by fostering higher enrollment rates in higher education. Kazakhstan has consistently increased enrollment in tertiary education, surpassing both other Central Asian countries and global averages. Tajikistan and Kyrgyzstan approach global averages when it comes to tertiary education gross enrollment rates, and in Uzbekistan, relative enrollment remains low, despite significant increase in the number of places at HEIs in recent years (Figure 3.2). Nevertheless, all countries in the region lag behind high-income countries, including Central European and Baltic states. In fact, Central Asia is experiencing a significant demand for higher education, with a growing number of individuals seeking access to university. However, higher education systems are facing challenges in meeting this increasing demand due to limited capacity and resources. This has created a mismatch between the demand for higher education and the ability of the systems to accommodate and cater to all aspiring students. It also should be noted that enrollments in master's programs are low (see Table 1.1): except for Kyrgyzstan, countries of the region are significantly behind members of the Bologna process.

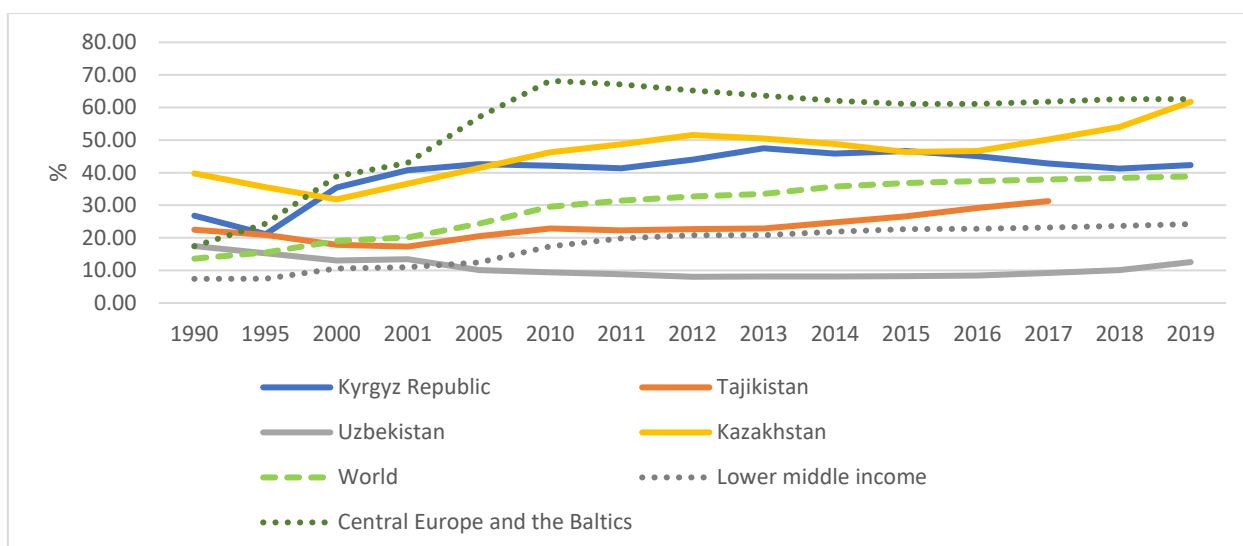
Significant disparities in access to higher education persist. Despite achieving nearly universal enrollment in upper secondary education (with enrollment rates of 91% in Kyrgyzstan, 95% in Uzbekistan and 112% in Kazakhstan),⁵³ significant social inequality persists in accessing higher education. In fact, there remains a substantial disparity in higher education enrollment rates between families in the highest- and the lowest-income quintiles. This gap is particularly pronounced in Kazakhstan and Kyrgyzstan, where students from wealthier families are five times more likely to attend university compared to their peers from lower socio-economic backgrounds (Table 3.2).⁵⁴ This disparity in educational opportunities is due to a shortage of budget-funded places and to the limited ability of families to invest in higher education. Indeed, higher education in Central Asia is expensive: on average, the cost of education in Central Asian HEIs amounts to 30-60% of the average per capita income.⁵⁵ Except for Kazakhstan, budget-funded places in the region generally covers not more than 20% of the student body (Table A.1). As a result, students frequently pay tuition fees in full, making it difficult for children from low-income families to enter a HEI.

⁵³ UIS statistics. Gross enrolment ratio, upper secondary education. URL: <http://data.uis.unesco.org/#>. Note: data for 2019 were used for Uzbekistan; for 2020 - for Kazakhstan; and for 2021 - for Kyrgyzstan.

⁵⁴ According to the data from the World Inequality Database on Education. URL: <https://www.education-inequalities.org/>

⁵⁵ In Kazakhstan education at a public HEI costs about 30%-60% of average per capita income, in Tajikistan - 20%-70%, in Kyrgyzstan - 40%, and in Uzbekistan - about 30%. Authors' calculations based on the data in Table A.1 and data on average disposable income per capita in a corresponding year.

Figure 3.2. Gross enrollment in tertiary education, % (1990-2019)



Source: World Bank. School enrollment, tertiary (% gross). URL: <https://data.worldbank.org/indicator/SE.TER.ENRR>

There are large territorial disparities in access to higher education in Central Asian countries. There is a noticeable difference in access to higher education between urban and rural areas in all Central Asian countries, despite efforts to reduce this gap. Most educational institutions are located in capital cities, with almost all universities in Central Asia listed in the QS University ranking for Emerging Europe and Central Asia (EECA) located in capitals. As a result, there is a notable discrepancy in higher education enrollment rates between families residing in urban areas and those in rural areas, with the former experiencing enrollment rates that are 2 to 3 times higher than the latter (Table 3.2). For example, in Bishkek, higher education enrollment rates for the 18-22-year-old cohort stand at 55%, while the rates in all other regions, are around 20%, and in the Talas district, it drops even below 15%.⁵⁶ Accordingly, in Kyrgyzstan, state scholarships for higher education are distributed by centralized quotas, in proportion to the share of schools in different districts, with almost 50% of scholarships in 2022 provided to graduates of rural schools.⁵⁷ However, according to experts, many rural school students do not meet the minimum university admission threshold during university admission examination. A similar situation exists in Kazakhstan: in Almaty, higher education enrollment rate is 59%, compared to 13-18% in Kyzylorda, Atyrau or Jambul.⁵⁸ In Uzbekistan, Tashkent, which accounts for less than 6% of 18-19-year-old population, has about of 35% of university applicants, while in Kashkadarya, the figures are 11% and 5.5% respectively.⁵⁹

⁵⁶ World Inequality Database on Education. 2014. URL: <https://www.education-inequalities.org/>. The Attendance rate indicator was used, 18-22

⁵⁷ Center for Educational Assessment and Teaching Methods. (2022). Results of National Scholarship Test and Enrollment to Grant and Contract-based Places at Universities of Kyrgyz Republic in 2022. URL: https://testing.kg/media/ORT_Report_Final_ru.pdf

⁵⁸ Ibid, 2015. The Attendance rate indicator was used, 18-22

⁵⁹ According to the data from the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan. URL: <https://edu.uz/uz/otm/index>

Table 3.2. Higher education enrollment rates by social status and place of residence (2012 – 2015)

	Education at a HEI*		Graduation from a HEI**	
	The poorest/ The richest	Village / City	The poorest/ The richest	Village / City
Kazakhstan	11% / 54%	14% / 40%	15%/72%	31% / 57%
Kyrgyzstan	12% / 52%	21% / 42%	12% / 66%	25% / 54%
Tajikistan	11% / 43%	14% / 34%	5% / 36%	11% / 28%
Uzbekistan	n.a.	n.a.	n.a.	n.a.

Note: * Percentage of people aged 18-22 years attending higher education (attendance rate); ** Percentage of people aged 25–29, who have completed at least 4 years of higher education (completion rate).

Source: World Inequality Database on Education. URL: <https://www.education-inequalities.org/>. Data for Kazakhstan are for 2015, for Kyrgyzstan – for 2014, and for Tajikistan – for 2012.

Despite improvements over the past years, gender disparities in higher education enrollment remain a significant problem for some countries in the region. In Tajikistan, women are substantially less represented in higher education than men: they represent only 37.4% of the total number of students (2022).⁶⁰ Although the situation has been gradually improving over the last years, gender parity has not yet been achieved in Uzbekistan as well: women account for 45.6% of students at public HEIs (2022). In contrast, in Kazakhstan and Kyrgyzstan the share of women in tertiary education exceeds the share of men.⁶¹ Enrolling women in STEM education remains a challenge for the region. While in OECD countries 52% of STEM students are women, their share is substantially lower in Central Asian countries.⁶² In Uzbekistan the share of female graduates of STEM programs is approximately 40%, while this share is around 30% only in Kyrgyzstan.⁶³

C. Relevance of Higher Education Programs

Programs offered by HEIs in Central Asian countries are not well aligned with the needs of the labor market. Despite changes in economies since gaining independence (Figure A.1.), there has been little changes in the distribution of students across specializations. In fact, as under the Soviet area, half of the higher education system continues to produce graduates for social sectors, such as education and healthcare. In Kazakhstan and Uzbekistan, approximately one in every four university graduates has a degree in pedagogy, whereas in Tajikistan and Kyrgyzstan, the proportion is approximately one in every five graduates. In addition, medical professions account for 7-20% of the total number of university graduates in Central Asia (Figure A.2). However, the education and healthcare sectors employ only 10-13% and 5-6% of the population respectively in these countries. Looking specifically at the share of graduates in STEM programs, Central Asian countries perform well on a global scale, ranging from 20% in Kyrgyzstan to 34% in Uzbekistan.⁶⁴ However, they still fall short of the levels achieved by European countries. Moreover, it is unclear whether the quality of education in these areas is aligned with international standards.

Central Asian labor markets present skills mismatches. Central Asian countries have well-educated workforces: the share of workers with high level of education is 72% for Uzbekistan (2020), 74% for Kyrgyzstan (2018), and 66% for Tajikistan (2016).⁶⁵ However, employer surveys in the region show that skill mismatches are widespread.⁶⁶ According to a survey from the World Economic Forum, Tajikistan,

⁶⁰ Agency on Statistics under President of the Republic of Tajikistan. (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe

⁶¹ World Bank. School enrollment, tertiary (% gross). URL: <https://data.worldbank.org/indicator/SE.TER.ENRR>

⁶² According to the data from OECD (2021), Education at a Glance 2021: OECD Indicators, OECD Publishing, Paris, <https://doi.org/10.1787/b35a14e5-en>.

⁶³ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

⁶⁴ World Bank. 2019. US STEM (ISCED and Tertiary). URL: [https://databank.worldbank.org/US-STEM-\(ISCED-and-Tertiary\)/id/cd77ac48](https://databank.worldbank.org/US-STEM-(ISCED-and-Tertiary)/id/cd77ac48)

⁶⁵ According to the data from the World Bank. Labor force with advanced education (% of total working-age population with advanced education). URL: <https://data.worldbank.org/indicator/SL.TLF.ADVN.ZS>

⁶⁶ OECD (2018). Enhancing Competitiveness in Central Asia, Competitiveness and Private Sector Development, OECD Publishing, Paris.

Kyrgyzstan, and Kazakhstan rank at the bottom in terms of the ease of finding skilled employees.⁶⁷ The relevance of graduates' skills is also a concern, with almost half of the companies in the region facing difficulties in recruiting qualified employees.^{68,69} For example, the share of companies that evaluate labor force as "inadequately educated" is higher in Kyrgyzstan than in other low-income or middle-income countries.⁷⁰ Accordingly, countries face shortages of qualified employees, especially in healthcare, education, industry, transportation, and housing and utility sectors.⁷¹

The linkages between industry and universities in Central Asia remain weak. The legacy of the Soviet era, where research institutes traditionally focused on research activities while HEIs concentrated on educational programs, is still evident in the region. Consequently, research institutes maintained close connections with the industry, while HEIs have not developed such relationships to the same extent. As a result, industry and employers are poorly integrated in university activities, often viewing universities as mere "service providers" rather than essential partners. In turn, universities do not perceive the industry as a key stakeholder in their activities. Instead, the state remains the primary customer for universities, resulting in imbalances in the structure of educational programs. Moreover, centralized regulations limit the flexibility of industry's engagement in the educational process.

The curriculum in many universities in Central Asia is outdated and fails to meet current and future labor market needs and economic development objectives. Despite efforts to modernize education, strict standards and sectoral specialization have limited the autonomy of universities in designing up-to-date educational programs. According to experts, key textbooks and learning materials in national or Russian languages are substantially outdated and are not aligned with modern requirements. Additionally, there is a lack of industrial internships or other formats of work-based learning opportunities, and employers have limited engagement in developing curricula. Although mechanisms for cooperation between industry and universities exist, they have not been fully utilized, and there is a need for further improvement. For example, in Kazakhstan, academic committees in HEIs are required to include industry representatives. However, experts indicate that these committees often serve as mere formalities, lacking genuine interest and active participation from both HEIs and employers.

Educational programs in Central Asia do not focus on the acquisition of soft skills. A recent survey of university students and faculty members in Kazakhstan indicates that approximately half of the respondents had little to no soft skills.⁷² Moreover, according to experts, only a few leading HEIs in Kyrgyzstan (AUCA, UCA, IUK) specifically target the acquisition of soft skills within the courses they provide. In Uzbekistan, employers regularly report that even employees with higher education degrees lack both hard and soft skills, with a particular emphasis on gaps in digital competencies and foreign languages.⁷³ In fact, Uzbek students themselves indicate that HEIs do not equip them with the required soft skills for their successful integration in the labor market.⁷⁴ For example, a study revealed that only 7% of economics courses in selected universities of Uzbekistan specifically aimed at developing soft skills.⁷⁵

The demand for green skills in Central Asia is projected to increase, yet it remains uncertain whether universities will be able to meet this demand. The demand for green skills in Central Asia is expected to increase significantly, as the region acts on its carbon neutrality commitments. All countries of the region

⁶⁷ Ease of finding skilled employees. The following question from the questionnaire was used: "In your country, to what extent can companies find people with the skills required to fill their vacancies?" [1 = not at all; 7 = to a great extent] | 2018–2019 weighted average or most recent period available. The Global Competitiveness Report. World Economic Forum, 2019.

⁶⁸ Skillsset score. Average score of the following two Executive Opinion Survey questions: "In your country, to what extent do graduating students from secondary education possess the skills needed by businesses?" and "In your country, to what extent do graduating students from university possess the skills needed by businesses?" In each case, the answer ranges from 1 (not at all) to 7 (to a great extent). | 2018–2019 weighted average or most recent period available.

⁶⁹ UNESCO. (2021). Policy brief: higher education in Central Asia. URL: <https://unesdoc.unesco.org/ark:/48223/pf0000377911>

⁷⁰ Izvorski, Ivailo V.; Mbowe, Appolenia; Dubashov, Bakyt; Gassner, Katharina B.; Ferrantino, Michael Joseph; Islam, Roumeen; Sahovic, Tarik; Kumar, Praveen. Kyrgyz Republic - Country Economic Memorandum: Main Report (English). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/679681585289928309/Main-Report>

⁷¹ Dankov, A. (2020) The Paradoxes of Social and Economic Development in Central Asia. Russian International Affairs Council

⁷² Amantay, Z. A., & Ermakov, D. S. (2021, June). Socio-pedagogical Features of the Formation of Soft Skills in the Republic of Kazakhstan. In 1st International Conference on Education: Current Issues and Digital Technologies (ICECIDT 2021) (pp. 17-22). Atlantis Press.

⁷³ World Bank (2021). Youth Employment in Uzbekistan: Opportunities and Challenges.

⁷⁴ ILO (2021). Towards Full and Productive Employment in Uzbekistan: Achievements and Challenges.

⁷⁵ Review.uz (2022). Soft skills in employment of university graduates. URL: <https://review.uz/post/soft-skills-v-trudoustroystvve-vpusknikov-vuzov>

have developed comprehensive green economy national strategies and programs, with Kazakhstan leading the way in 2013,⁷⁶ followed by Kyrgyzstan in 2018,⁷⁷ Uzbekistan in 2019,⁷⁸ and Tajikistan in 2022.⁷⁹ These commitments will have an important impact on the economy of these countries, especially with the significant share of products in Central Asia coming from extractive industries. As a result, there is a growing need for green skills and professions, such as water resource management, climate-smart agriculture or environmentally resilient land use. However, it is unclear whether HEIs will be able to develop the required courses to equip students with the required green skills.

The ongoing digital transformation in Central Asia highlights the need to develop digital skills. While Kazakhstan and Tajikistan have strong positions in employee digital skills proficiency rankings, ranking 43rd and 57th out of 140, respectively, the situation is more challenging in Kyrgyzstan, which ranks 91st.⁸⁰ Other survey data indicate that in Uzbekistan, 43.5% of women and 30% of men aged 15-29 do not have computer skills.⁸¹ In Kyrgyzstan, only 30% of women aged 15-24 demonstrate proficiency in ICT skills, with the figure dropping to 21% for the 15-49-year-old age group.⁸² In Kazakhstan, according to the results of *Survey of Adult Skills*,⁸³ respondents demonstrated problem-solving skills in technology-rich environment were slightly below the average for OECD countries.

There is limited information on the readiness of higher education systems for digitalization and on its potential transformation to meet the needs of the labor market. Most data indicators are aggregated at the national level, without providing detailed information for individual HEIs. This substantially hinders systems' ability to identify and address specific barriers to the widespread use of digital technologies in teaching and learning, research, as well as in managerial functions. However, HEIs can function as the main drivers of digital transformation in the region, which at the moment lags behind global averages in terms of the adoption of information technologies (see Annex B).

The development of national learning outcomes and qualification frameworks is ongoing but there is a need for better alignment. The process of developing national qualifications frameworks has been initiated in all Central Asian countries. However, educational standards (classifiers) are poorly aligned with professional frameworks and with the labor markets' needs. Additionally, qualifications frameworks in the region are not aligned with each other as well, creating challenges for labor mobility. Currently, there is no system in place for assessing competencies that is verified by employers, and the qualifications frameworks remain primarily a policy document without effective implementation mechanisms. As a result, they are not yet serving as a reliable tool for recording student achievements, recognizing acquired skills and knowledge, as well as ensuring an integrated lifelong learning system, or facilitating participation in the global and regional labor markets. Finally, labor market forecasting is not developed in the region – there are no specialized skills-related surveys and forecasts.⁸⁴

The demographic growth in Central Asia is expected to exacerbate labor market imbalances. For example, in Kyrgyzstan, with 33% of the population under 18,⁸⁵ demographic pressure creates important

⁷⁶ Decree of the President of the Republic of Kazakhstan No. 577 dated May 30, 2013 “On Concept for transition of the Republic of Kazakhstan to green economy”. URL: <https://adilet.zan.kz/rus/docs/U1300000577>

⁷⁷ Ministry of Economy and Commerce of the Kyrgyz Republic. Green Economy Program. URL: <https://mineconom.gov.kg/ru/direct/302/335>

⁷⁸ Resolution of the President of the Republic of Uzbekistan “On approval of the strategy for transition of the Republic of Uzbekistan to green economy for 2019-2030”. URL: <https://lex.uz/ru/docs/4539506>

⁷⁹ CIS Internet Portal. The Strategy for development of green economy in Tajikistan was presented in Dushanbe. URL: <https://e-cis.info/news/567/105268/>

⁸⁰ Ranking has been compiled based on responses to the questions “In your country, to what extent does the active population possess sufficient digital skills (e.g. computer skills, basic coding, digital reading)?” [1 = not all; 7 = to a great extent] | 2018–2019 weighted average or most recent period available Source: World Economic Forum, Executive Opinion Survey (various editions).

⁸¹ UNICEF (2020). Youth of Uzbekistan: Challenges and Prospects. New York: UNICEF. <https://www.unicef.org/uzbekistan/media/4676/file/Youth%20Report%20ENG.pdf>

⁸² National Statistical Committee of the Kyrgyz Republic. (2020). Monitoring of indicators of Sustainable Development Goals in Kyrgyz Republic.

⁸³ OECD. Kazakhstan – Country Note – Survey of Adult Skills results. URL: https://www.oecd.org/skills/piaac/publications/countryspecificmaterial/PIAAC_Country_Note_Kazakhstan.pdf

⁸⁴ OECD. (2018). Enhancing Competitiveness in Central Asia. URL: <https://www.oecd-ilibrary.org/development/9789264290129-ru>

⁸⁵ Asian Development Bank. (2021). Technical and Vocational Education and Training in Tajikistan and Other Countries in Central Asia. Key Findings and Policy Options. URL: <https://www.adb.org/sites/default/files/publication/691671/tvet-tajikistan-central-asia.pdf>

challenges for the development of the higher education sector and ensuring the training of the future workforce. In Uzbekistan, the economy creates an average of 280,000 new jobs annually, while over 600,000 graduates enter the labor market each year.⁸⁶ Thus, a large number of university graduates are employed in low-skilled jobs in the informal sector, indicating an imbalance between education and the labor market.⁸⁷ This trend could also lead to further brain drain, as university graduates seek better opportunities abroad.

To address these imbalances, there is a need to increase the number of graduates from master's programs. By providing advanced educational opportunities at the master's level, countries can attract and retain talented individuals within their own education systems. Indeed, master's programs offer specialized knowledge and advanced skills that are highly valued in various sectors. However, except for Kyrgyzstan, Central Asian countries have a lower proportion of master's students in tertiary education compared to high-income countries. For example, in Kazakhstan and Uzbekistan, the share of master's students in tertiary education does not exceed 4%,⁸⁸ while in countries like Germany, Estonia and Bulgaria this figure is around 32-34%.⁸⁹ There is also insufficient funding of master's programs. For example, in Kazakhstan, the size of state scholarship for master's programs is on average two times lower than that of bachelor's programs, leading HEIs to prioritize undergraduate programs over developing postgraduate programs.

⁸⁶ Asian Development Bank. (2021). Technical and Vocational Education and Training in Tajikistan and Other Countries in Central Asia. Key Findings and Policy Options. URL: <https://www.adb.org/sites/default/files/publication/691671/tvet-tajikistan-central-asia.pdf>

⁸⁷ *ibid*

⁸⁸ Authors' calculations based on the data from Table A1.

⁸⁹ According to the data from UNESCO Statistics, URL: <http://data.uis.unesco.org/#>

Science, Research and Innovation in Higher Education

Central Asian HEIs face challenges in prioritizing research activities, resulting in underdeveloped research capacity, which hinders the commercialization of research results and integration in national innovation ecosystems. Chronic underfunding of science in Central Asia has resulted in small numbers of scientific staff in HEIs, undeveloped research infrastructure, and limited research activity. The research skills of scientific staff become outdated rapidly, while the research profession is unattractive to young scientists. As a result, strong research centers have not emerged in Central Asian universities, and both the quality and quantity of publications have suffered. Additionally, low levels of cooperation between research communities, weak global positioning, and a lack of established collaboration practices between universities and research institutes hinder scientific capacity building. Moreover, the lack of incentives for technological entrepreneurship, coupled with limited demand from businesses for innovative developments and underdeveloped technology transfer infrastructure, has resulted in the early-stage development of innovative activities and the commercialization of research results. However, in selected research areas, there is a potential for global competitiveness. The number of publications is increasing, while the system for scientific staff training is gradually modernizing. There is a window of opportunity for universities to integrate into the emerging national innovation ecosystems.

Table 3.3. Key Challenges and Opportunities Regarding Science, Research and Innovation in Higher Education

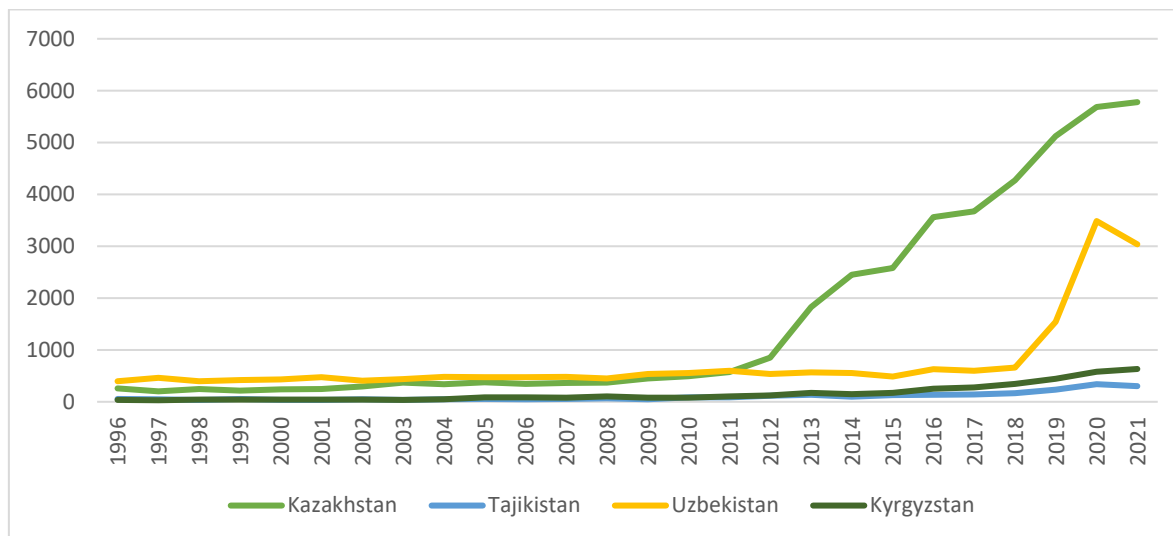
Key Challenges	Opportunities
<ul style="list-style-type: none"> • Low global outreach and decrease in the quality of academic publications amidst an increase in the quantity. • Outdated research infrastructure and uncompetitive wages combined with the dispersion of resources between universities and research institutes. • Weak global academic reputation due to the shortage of globally competitive research centers within universities. • Shortages of research staff, ongoing modernization of scientific training system, lack of research skills and academic culture severely limit research productivity and capacity. • Insufficient investments in R&D and low demand for university-developed technologies negatively impact linkages between universities and industry. • Shortage of personnel and infrastructure for technology transfer, insufficient intellectual property frameworks do not stimulate the commercialization of research results. 	<ul style="list-style-type: none"> • Developing research skills and academic ethics, capitalizing on international co-authors, ensuring adequate publication infrastructure to increase the number of publications while fostering quality. • Strengthening research capacity by creating centers of excellence, attracting world-class researchers, and full implementation of the Ph.D. model. • Facilitating cooperation between strong research institutes and universities at the regional level, shared use and investment in research infrastructure and in technology transfer. • Ensuring transparent competition and research performance evaluation, prioritizing public investment to address regional challenges and facilitating the commercialization of research results. • Involving industry expertise in setting research priorities and quality assurance. • Fostering technology transfer by incentivizing business co-investment, training technology transfer specialists and integrating universities into the emerging national innovation ecosystems.

A. Research Productivity

All Central Asian countries have experienced a significant surge in their publication activities over the last decade. The academic and technical journals have observed the most rapid increase in publication activity. This growth has been particularly impressive in Kazakhstan and Uzbekistan (Figure 3.3.). Kazakhstan and Kyrgyzstan have outperformed the global averages (21%) and the most rapidly developing

countries in this field, such as China (61%) and Russia (127%),⁹⁰ with several times faster growth rates (Table 3.4.). The growth rates in Uzbekistan and Tajikistan have been more modest (8% and 32%, respectively). However, some experts believe that this explosive growth in some countries might be due, in part, to an increase in publications in predatory journals that charge publication fees and do not meet adequate quality standards.

Figure 3.3. Number of publications in Central Asian countries in academic journals, all disciplines (1996-2021)



Source: according to the data from SJR, URL:

[https://www.scimagojr.com/comparecountries.php?ids\[\]=kz&ids\[\]=tj&ids\[\]=uz&ids\[\]=kg](https://www.scimagojr.com/comparecountries.php?ids[]=kz&ids[]=tj&ids[]=uz&ids[]=kg)

Table 3.4. Research expenditures, publication activity, and number of researchers in Central Asian countries (2018-2021)

	Gross research and development expenditures (2020)	Number of researchers per 1 million people (2018/2021)	Number of Ph.D. students/post-graduate students (2021)	Total number of publications in academic journals, all disciplines (average for 2011-2021)	Number of publications with international co-authorship (2021)	Share of publications in the country in the total global number of scientific and technical publications (2018, %) / Increase in the number of publications in academic and technical journals from 2012 to 2018 (%)
Kazakhstan	0.13	630 (2021)	5924	3070	59	0.093%/431%
Uzbekistan	0.14	504 (2021)	3 880	1100	33	0.014% / 8%
Tajikistan	0.09	292 (2018)	1296	165	80	0.002% / 32%
Kyrgyzstan	0.09	563 (2018)	2400	280	74	0.005% / 172%

Source: See footnote⁹¹

⁹⁰ Authors' calculations based on the data from the World Bank.

⁹¹ Gross research and development expenditures – based on the data from the World Bank, 2020, Research and development expenditure (% of GDP), URL: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS> ;

Number of researchers per million people – for Kazakhstan based on the data from the World Bank, 2021. Researchers in R&D (per million people), URL: <https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6>, for Uzbekistan, Tajikistan and Kyrgyzstan – Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing;

Number of Ph.D. students/post-graduate students – for Kazakhstan – based on the data from the Bureau of National Statistics, Statistical Collection “Education in the Republic of Kazakhstan 2017-2021”; for Uzbekistan – State Committee of the Republic

While each country has its own specialization, Kazakhstan is the leader in scientific productivity in the region. Each country in the region has its own specialization in publication activities: for instance, engineering sciences and physics are the dominant areas of publication in Kazakhstan and Uzbekistan. However, Kazakhstan accounts for almost 60% of all publications in the region, including almost 80% in social sciences, 75% in computer sciences, and 73% in engineering sciences.⁹² Meanwhile, Uzbekistan also specializes in biochemistry, genetics, molecular biology, and mathematical physics. Kyrgyzstan focuses mainly on earth and environmental sciences, while the share of publications in medicine is growing as well. Finally, Tajikistan has a well-diversified portfolio of specializations, including earth sciences, engineering, materials science, and medicine.⁹³

The total number of publications remains low and prevents the region from securing a prominent presence in the global research map. In 2019, the total number of publications per million people in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan was 202, 49, 21, and 34, respectively. This is significantly lower than the 490 publications per million people in G20 countries.⁹⁴ Moreover, although the economies of Central Asia account for 0.7% of the global GDP,⁹⁵ their contribution to the total number of academic publications is less than 0.2% (2021).⁹⁶ In terms of scientific and technical publications, Central Asia's overall share in the total number of publications worldwide barely exceeds 0.1% (see Table 3.4.), whereas Russia accounts for 3.1%, Brazil for 2.4%, Türkiye for 1.3%, and the United States for 16.5%.⁹⁷

Most publications by Central Asian researchers involve foreign co-authors. More than 60% of publications in Central Asian countries were prepared with foreign co-authors, which makes the region one of the global leaders in this regard. Russia remains a key foreign scientific partner for all countries in the region. The United States is the second key partner for Kazakhstan and Tajikistan, while Germany – for Kyrgyzstan, and China for Uzbekistan.

Countries of the region are gradually integrating into the global academic community, but research results are disseminated mainly at the local level. Publications by scientists from Central Asia are not well represented in top academic journals that are indexed by Web of Science and Scopus. Key barriers prevent researchers from submitting articles in high-quality journals, including excessive bureaucracy, heavy teaching load, poor foreign language skills, limited access to equipment, and a lack of knowledge on research methodologies.⁹⁸ As a result, Central Asian scientists primarily focus their publication activities on academic journals from the CIS and conference collections.⁹⁹ However, the majority of these journals do not have an international positioning or double-blind review. Moreover, publication is often predetermined by internal interests within specific research institutes or universities, and editorial policies tend to be locally oriented, with editorial councils lacking an emphasis on publishing internationally

of Uzbekistan on Statistics. 2022. Main Statistical Indicators of Science and Innovation in the Republic of Uzbekistan, URL: https://stat.uz/images/inovatsiya_110822_anglizki.pdf; for Tajikistan – based on the data from the Agency on Statistics under President of the Republic of Tajikistan (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe; for Kyrgyzstan – based on the data from the National Statistical Committee of the Kyrgyz Republic, URL: <http://www.stat.kg/ru/news/nauka-v-kyrgyzskoj-respublike1-cifry-i-fakty/>;

Total number of publications in academic journals, all disciplines, average for 2011-2021 – authors' calculations based on the data from SJR, 2021.

Number of publications with international co-authorship – based on the data from SJR, International collaboration, %, 2021, Document ratio whose affiliation includes more than one country address, URL:

[https://www.scimagojr.com/comparecountries.php?ids\[\]=kz&ids\[\]=tj&ids\[\]=uz&ids\[\]=kg;](https://www.scimagojr.com/comparecountries.php?ids[]=kz&ids[]=tj&ids[]=uz&ids[]=kg;)

Share of publications in the country in total global number of scientific and technical publications (% , 2018) / Increase in the number of publications in academic and technical journals from 2012 to 2018 (%) – based on the data from the World Bank, Scientific and technical journal articles, URL: <https://data.worldbank.org/indicator/IP.JRN.ARTC.SC>

⁹² Authors' calculations based on the data from SJR, 2021.

⁹³ According to the data from SJR country profiles. URL: <https://www.scimagojr.com/countryrank.php>

⁹⁴ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

⁹⁵ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

⁹⁶ Calculated based on the data from SJR, data from Ovezmyradov, B., & Kepbanov, Y. (2021). Human capital and liberalization in Central Asia: comparative perspectives on development (1991–2020). Lund University (Media-Tryck).

⁹⁷ Author's calculations based on the data from the World Bank, Scientific and technical journal articles, URL: <https://data.worldbank.org/indicator/IP.JRN.ARTC.SC>

⁹⁸ Kuzhabekova, A., & Ruby, A. (2018). Raising research productivity in a post-Soviet higher education system: A case from Central Asia. *European Education*, 50(3), 266-282.

⁹⁹ Ministry of Innovative Development of the Republic Uzbekistan. (2021). National Report on Science and Innovations of the Republic of Uzbekistan for 2017-2020, Tashkent.

comparative research findings. Therefore, the increase in the number of publications is primarily attributed to the lower selectivity of academic journals in national languages.

The increase in the number of publications in Central Asia goes hand-in-hand with a decrease in their average quality. Scientific articles from researchers in Central Asia have on average low citation rates per article, performing below G20 countries, other Asian countries, as well as countries with lower national income (see Figure A.3). For example, Baltic states outpace Central Asia both in terms of the number of publications and citation rates, despite having considerably smaller populations.¹⁰⁰ In addition, over the last two decades, the number of publications without any citation has more than doubled across all countries of the region (see Figure A.4.). This relatively low quality of publications can be attributed, at least in part, to the prevailing principles of science performance assessment and funding in the region, which prioritize quantity of publication over their quality and fail to account for international standards. For example, amid the rising number of publications, in 2020, more than 20% of articles of scientists from Uzbekistan were published in journals that were excluded from Scopus.¹⁰¹ To address this problem, the Uzbek government has introduced incentives for publications in international journals, offering bonuses ranging from 0.2 to 3 times the monthly salaries of researchers, depending on the quality of academic publications.¹⁰²

The region lacks infrastructure for disseminating scientific research results. While there is a broad network of academic journals in Central Asia, their quality and international recognition leave room for improvement. For instance, in Kazakhstan, the list of recommended journals for publishing key research results includes 121 local journals,¹⁰³ while Tajikistan's Supreme Attestation Commission (SAC) and Kyrgyzstan's SAC have recommended 47¹⁰⁴ and 52¹⁰⁵ journals, respectively. However, among all Central Asian countries only seven Kazakh journals are indexed in Scopus, mostly in the 3rd-4th quartile. In addition, 14 Kazakh and four Uzbek journals are represented in the Web of Science.¹⁰⁶ As a result, the region significantly lags behind other post-Soviet countries in terms of global journal representation.¹⁰⁷

B. Research Cooperation and Infrastructure

The separation in research between universities and sectoral research institutes is a growing concern. In most national innovation systems, approximately two thirds of research projects are funded by businesses, while universities account for the majority of expenditures.¹⁰⁸ However, Central Asia has preserved some features of the Soviet model, where the state continues to play a dominant role in funding research, and national academies of science and sectoral research institutes still hold central positions. The absence of unified rules for competing for research funding has led to structural imbalances.

- Kazakhstan heavily relies on sectoral research institutes, while universities focus primarily on providing educational services.
- In Kyrgyzstan, organizations and research institutes affiliated with the Kyrgyz National Academy of Science accounted for more than 70% of scientific and technical works in 2021.¹⁰⁹

¹⁰⁰ Ovezmyradov, B., & Kepbanov, Y. (2021). Human capital and liberalization in Central Asia: comparative perspectives on development (1991 – 2020). (Research report in Sociology of Law 2021:3. Lund University.)
Lund University (Media-Tryck)

¹⁰¹ *ibid*

¹⁰² Ruziev, K. and Mamasolieva, M. (2022). Building University Research Capacity in Uzbekistan. In: Chankseliani, M., Fedyukin, I. and Frumin, I. (2022). Building Research Capacity at Universities: Insights from Post-Soviet Countries. <https://link.springer.com/content/pdf/10.1007/978-3-031-12141-8.pdf?pdf=button>

¹⁰³ List of periodicals recommended by the Committee for Quality Assurance in the Sphere of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan for publication of key research activity outcomes. URL: <https://www.gov.kz/memleket/entities/control/documents/details/332827?lang=ru&ysclid=lerehhd8s9713752302>

¹⁰⁴ List of peer-reviewed journals of SAC of Tajikistan. URL: <https://vak.tj/index.php/ru/retsenziruemoie-izdanie/spisok-retsenziruemykh-zhurnalov-rt>

¹⁰⁵ List of peer-reviewed scientific periodicals for publication of key thesis research results of SAC of Kyrgyzstan. URL: <Perechen-29.12.2020.pdf> (vak.kg)

¹⁰⁶ According to the data from the Web of Science, 2022

¹⁰⁷ According to the data from SJR, 2022.

¹⁰⁸ Ovezmyradov, B., & Kepbanov, Y. (2021). Human capital and liberalization in Central Asia: comparative perspectives on development (1991 – 2020). (Research report in Sociology of Law 2021:3. Lund University.)
Lund University (Media-Tryck)

¹⁰⁹ National Statistical Committee of the Kyrgyz Republic. URL: <http://www.stat.kg/ru/news/nauka-v-kyrgyzskoj-respublike1-cifry-i-fakty/>

- Tajikistan follows the Soviet model of sectoral division between universities and research institutes, with academic institutions affiliated with the Tajik National Academy of Science, such as the Academy of Medical Sciences, the Academy of Agricultural Sciences, and the Academy of Education receiving the lion's share of research funding. In fact, HEIs receive less than 20% of scientific research and development funding,¹¹⁰ even though, they are significantly more active in publication activity,¹¹¹ and HEIs have three times more scientific staff than research institutes (13,191 and 3,478, respectively).¹¹²
- In Uzbekistan, almost 60% of public funding for research is allocated to research institutes, while nearly 80% of scientific staff are employed at HEIs.¹¹³

Although collaboration between sectoral research institutes and HEIs has intensified over the last years, it remains limited. This type of cooperation is primarily promoted in a top-down manner, rather than driven by institutions themselves. In fact, HEIs and research institutes often have conflicting interests, resulting in limited cooperation and competition for scarce research funding. Moreover, researchers in these institutions have varying qualifications, expectations, evaluation criteria, and salaries, making it difficult to establish systematic interaction between the two communities. Consequently, selected scientific disciplines with strong potential for cooperation are disconnected and fragmented across separate institutions or research teams, leading to a duplication of efforts.

There is a shortage of competitive research centers within universities in the region. Most key research institutes have been established during the Soviet era, and while some of them have a prominent research capacity, they have had few opportunities for quality development during the transition period. As a result, they fall behind global research centers according to most metrics. In addition, the institutional separation between education and science has prevented universities from developing advanced scientific schools, and indicators showing international relevance of research centers in the region are at zero or nearly zero.^{114, 115} In fact, only 11 Kazakh and two Uzbek institutions are included in the 2021 SCImago Ranking of worldwide universities and research institutions, compared to 315 institutions in Russia and 10 in Lithuania, despite the latter having a smaller population than the Central Asian countries.

The global academic reputation of universities in the region remains weak, with the exception of Kazakhstan. Except for Kazakhstan, Central Asian countries do not have a prominent position in global university rankings yet. For instance, the QS ranking includes 16 universities from Kazakhstan and one from Kyrgyzstan, while THE includes three universities from Kazakhstan. Other universities from the region are not represented in THE and ARWU rankings at all. In the 2022 QS EECA ranking, there are two universities from Kyrgyzstan, four universities from Uzbekistan, one university from Tajikistan and 31 universities from Kazakhstan.¹¹⁶ In comparison, countries in the Caucasus and Baltic states have at least one university present in QS and THE rankings. In total, the Caucasus region has four universities in QS and three universities in THE, while Baltic states have 10 universities in QS and 12 universities in THE.¹¹⁷

Research infrastructure in Central Asia requires substantial modernization. Only a limited number of universities have research infrastructure aligned with international standards,¹¹⁸ but even when available, it is often underutilized or misused due to a lack of qualified staff, research projects, and sources of funding. In fact, the majority of HEIs have poorly equipped libraries, including a lack of subscription to international research databases and a shortage of advanced laboratory equipment. Even in Kazakhstan, where situation

¹¹⁰ Materials of Council on coordination of scientific research work in the field of natural, technical, medical, agricultural, humanitarian and social sciences in the Republic of Tajikistan. URL: <http://innovation.tj/wp-content/uploads/2022/05/kitob2020.pdf>

¹¹¹ Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda - Dushanbe, NPICenter, 2021 - p.102.

¹¹² Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda - Dushanbe, NPICenter, 2021 - p.102.

¹¹³ World Bank. 2020. Modernizing Uzbekistan National Innovation System (Munis) Project. Report No: PAD3955. Finance, Competitiveness and Innovation Global Practice - Europe and Central Asia Region. Washington, DC: World Bank.

¹¹⁴ According to the data from SJR. The score is calculated as the sum of reverse ranks estimated for all research institutions of a country that are included in the SCImago Institutions Rankings.

¹¹⁵ World Economic Forum. (2019). The Global Competitiveness Report. URL: <https://bit.ly/3L4BQ5M>

¹¹⁶ QS EECA University Rankings, 2022. URL: <https://www.topuniversities.com/university-rankings/eeeca-rankings/2022>

¹¹⁷ Based on the data from the Times Higher Education and QS agencies, 2022.

¹¹⁸ For example, Nazarbayev University in Kazakhstan, Tashkent State Technical University and Tashkent Institute of Irrigation and Agricultural Mechanization Engineers in Uzbekistan, Avicenna Tajik State Medical University in Tajikistan, Kyrgyz-Turkish Manas University, American University of Central Asia, University of Central Asia in Kyrgyzstan.

is relatively better than in other countries, the government recognizes that research infrastructure does not meet modern requirements for scientific research.¹¹⁹ Indeed, approximately 40% of fixed assets in universities are estimated to be in a state of wear and tear or obsolescence, and the majority of HEIs lack the necessary equipment for conducting experiments.¹²⁰ With the exception of the library at Nazarbayev University, no university library in the country provides comprehensive access to international academic databases.¹²¹ According to data from the National Patent Information Center, in 2018, in Tajikistan many equipment and devices at HEIs and research institutes were worn out and outdated, failing to meet the requirements of modern science.¹²² During focus groups in Kyrgyzstan, it was reported that HEIs lack modern teaching and learning materials, laboratories, equipment, libraries, technologies, including specialized supercomputers.

C. Academic Staff Capacity

Central Asia has one of the lowest shares of scientific staff worldwide and shortages of scientific staff remain common as well. With 689 full-time scientists per million people, the number of researchers in Kazakhstan has remain almost unchanged between 2012 and 2020, while in Uzbekistan this figure has even decreased to 423.¹²³ In comparison, the global average number of scientists per million people is almost 1,600 (2018), while in Central European and in the Baltic states, it reaches 2,960 (2020).¹²⁴ Moreover, between 2014 and 2018, the global pool of researchers was growing three times faster (13.7%) than the world population (4.6%) – but this trend has not been visible in Central Asia.¹²⁵ Indeed, many junior scientists and university graduates either choose non-academic professions, or seek better career opportunities abroad, which puts the future research capacity of these countries at risk.¹²⁶ Experts in focus groups reported that when competitions are announced to hire new academic staff, there are sometimes no applicants. The shortage of talent is particularly critical in STEM. For instance, the Bolashak program in Kazakhstan, which offers generous funding for education in leading universities worldwide, faces a deficit of Ph.D. applicants, despite severe competition for master’s programs.

The level of research skills among university staff limits opportunities for scientific research. In Uzbekistan, only 45% of researchers held a Ph.D. or Doctor of Sciences degree in 2021,¹²⁷ while in Tajikistan, the share of researchers with academic degrees is even lower, not exceeding 30% in both HEIs and research institutes.¹²⁸ The excessive teaching load mentioned above limits the time available to conduct research, and the lack of relevant research experience among administrative staff, department heads, and deans is yet another problem. As such, many researchers lack the required skills for conducting empirical. In fact, scientists from Central Asia often use descriptive or correlation approaches, while over the last 10 years there was substantial increase in demand for scientific articles that use more advanced research methods. This is further compounded by the absence of such skills among older generations of academic staff, which prevents their transmission to junior researchers. Finally, low proficiency in English is another obstacle for researchers from Central Asia. This language barrier poses a significant obstacle in accessing

¹¹⁹ On approval of the State program for development of education and science in the Republic of Kazakhstan for 2020 - 2025, URL: <https://adilet.zan.kz/rus/docs/P1900000988>

¹²⁰ Draft Law “On introducing changes and amendments to selected laws and regulations of the Republic of Kazakhstan on scientific matters.”

¹²¹ Kairatbekkyzy, M. (2016). Research impact of Kazakhstan: Informational problems and barriers. *Journal of Library Administration*, 56(7), 845-853.

¹²² NPICenter. (2021). Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda Dushanbe.

¹²³ Authors’ calculations based on the data from the World Bank, the indicator Researchers in R&D (per million people), 2021. URL: <https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6> Note: based on the data from the National Report on Science and Innovations of the Republic of Uzbekistan for 2022, the number of researchers per million people in Uzbekistan has reached 1002.

¹²⁴ *ibid*

¹²⁵ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing

¹²⁶ Mukhitdinova, N. (2015) Central Asia. In: UNESCO Science Report: Towards 2030. S. Schneegans and D. Eröcal (eds). UNESCO Publishing: Paris, pp. 365-387. URL: <https://uis.unesco.org/sites/default/files/documents/unesco-science-report-towards-2030-part1.pdf>

¹²⁷ Agency for Innovative Development of the Republic Uzbekistan. (2022). National Report on Science and Innovations of the Republic of Uzbekistan for 2022. Tashkent.

¹²⁸ NPICenter. (2021). Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda Dushanbe.

the latest scientific advancements, disseminating research results, and engaging in international cooperation. In particular, the lack of skills in academic English for writing scientific articles is a critical barrier to publication in the top international journals.

Academic and research culture needs to be further enhanced in Central Asia. Many researchers have a poor understanding and limited knowledge of the ethical norms associated with research. Thus, unethical practices, such as publication in predatory journals, are widespread, and HEIs are struggling to ensure the respect of ethical standards in research.

- In Kazakhstan, despite the state's efforts to address this challenge in a centralized manner, ethical culture in research and educational processes is still assessed as low by experts. In fact, the country has one of the highest shares of publications in potentially predatory journals globally.¹²⁹
- In Kyrgyzstan, requirements to plagiarism checks were implemented.¹³⁰ Nevertheless, according to the Kyrgyz Bureau for Human Rights, more than 60% of university professors in the country are still engaged in various forms of corruption.¹³¹
- In Tajikistan, although some steps have been taken in recent years to stimulate academic integrity, such as certificates on uniqueness of texts and anti-plagiarism services,¹³² experts indicate that a culture of low tolerance towards plagiarism is not yet widespread in HEIs.
- Since 2017, Uzbekistan has implemented a series of reforms to strengthen ethics in higher education. This includes increasing transparency in student admissions and staff recruitment, implementing measures to promote academic integrity, and developing anti-plagiarism mechanisms.¹³³ Despite some successes in selected HEIs, the education system still needs broader and deeper implementation of mechanisms to fight plagiarism and corruption.

There is a strong need for junior researchers equipped with modern research skills, but the quality of training at postgraduate and doctoral/Ph.D. programs needs to be substantially improved. Central Asia has experienced significant brain drain during the post-Soviet transition period, resulting in an aging research workforce trained during Soviet times. This situation perpetuates the transfer of outdated research skills from older generations to younger researchers. At the same time, a modern and comprehensive system for training junior scientists has not been fully developed yet. Due to the lack of top-level research institutes, postgraduate students are not able to adequately develop research skills. While courses and research workshops organized for postgraduate and Ph.D. students to acquire scientific research methodology, such courses are usually taught by older researchers that were not able to develop such competencies themselves. For example, in Kyrgyzstan, except for some private and international universities, HEIs almost do not have professors with Doctor of Philosophy/Ph.D. degrees that are familiar with Ph.D. requirements.

Postgraduate education is not attractive for the most talented students. There is insufficient support provided to postgraduate students/Ph.D. students, especially in comparison to what the private sector can offer. In general, apart from scholarships, postgraduate and Ph.D. students usually can rely only on limited support from their HEI. They struggle to secure funding for their own research (for example, expenditures for materials, fieldwork, etc.), and universities offer only few opportunities for employment of postgraduate and Ph.D. students during their studies. These factors make postgraduate education less attractive to competitive students, thereby limiting the potential of the region's scientific workforce.

- Kazakhstan has substantially increased the scholarships for Ph.D. students in recent years, and it currently amounts to around US\$400, which is slightly lower than the average salary of a researcher. However, this amount is hardly competitive, particularly in certain industries and regions.

¹²⁹ Macháček, V., & Sholec, M. (2022). Predatory publishing in Scopus: Evidence on cross-country differences. *Quantitative Science Studies*, 3(3), 859-887.

¹³⁰ 24.KG: There are fakes and plagiarism all around. Why are officials and deputies not ashamed? URL: <https://24.kg/obschestvo/91512>

¹³¹ 24.KG: 62 percent of country's university professors involved in corruption – Deputy, URL: https://24.kg/english/248001_62_percent_of_countrys_university_professors_involved_in_corruption_-_Deputy/

¹³² In 2020 during the meeting with academia and representatives of intellectual circles the President of the Republic of Tajikistan, distinguished Emomali Rahmon, has made the following comment with regard to plagiarism related to defense of theses: "This is a "disease" of modern technologies era, that young professionals and their advisers become infected with".

¹³³ UNESCO. (2020). Combating corruption in higher education in Uzbekistan. URL: <https://etico.iiep.unesco.org/en/combating-corruption-higher-education-uzbekistan>

- Scholarship for postgraduate students in Kyrgyzstan is equal to 1450 KGS (approximately US\$17), but it increases by 30 percent between the second and third years of study.¹³⁴
- In Tajikistan, scholarships for postgraduate students are equal to 846 TJS (US\$85, or approximately one half of average salary in the country), while for full-time Ph.D. students it ranges between 1400-2500 TJS (US\$140-250).
- Uzbekistan acts as an exception in this regard. Scholarships are aligned with the base salaries of research assistants for postgraduate students, and senior researchers for Ph.D. students.¹³⁵ The monthly scholarship for Ph.D. students is equal to approximately US\$300, which helps to attract students to doctoral programs.¹³⁶

The current format and procedures for thesis defense in Central Asia are bureaucratic and outdated.

In most Central Asian countries, the authority to award academic degrees still lies with the national attestation commissions, except in Kazakhstan where national universities have the autonomy to independently award degrees through dissertation councils. However, establishing dissertation councils is a cumbersome process, and they often lack the necessary expertise to assess the narrow research topics of Ph.D. students. Moreover, defending theses based on publications is also not widespread in the region. In Kazakhstan, defending theses based on articles in international peer-reviewed journals has been recently introduced but is still rare. Similar changes are taking place in other Central Asian countries: recently, selected universities in Uzbekistan have been granted the authority to award academic degrees and in Kyrgyzstan, future changes in regulations are expected to be introduced to provide for such defense opportunity.

The transition from a two-tier to a Ph.D. model will stimulate the development of research capacity.

Countries in the region largely maintain elements of the Soviet two-tier system, which consists of the Candidate of Sciences degree (more or less equivalent to Ph.D.) and the Doctor of Sciences degree (a more advanced degree than the Ph.D.). In this model, the Candidate of Sciences degree is seen as an intermediate step towards obtaining a Doctor of Sciences degree. However, in practice, researchers are only awarded a Doctor of Sciences degree towards the end of their research career. For example, in Kyrgyzstan the average age of a candidate for a Doctor of Sciences degree is 46,¹³⁷ which deters junior scientists from a research career. In contrast, the Western higher education system predominantly awards senior researchers with a Ph.D. degree, which demonstrates that the individual has fundamental knowledge in a specific scientific discipline and allows them to start an academic career. The transition to a Ph.D. model in Central Asia would simplify the integration of junior researchers into research projects and expedite the development of a core group of researchers in line with international standards.

Countries in the region are gradually transitioning to the Ph.D. model, but they are encountering challenges. Except for Kazakhstan, the transition to the Ph.D. model faces the resistance from some members of the academic community, especially senior staff who wish to preserve elements of the two-tier model. This has limited the full implementation of the reforms, but some countries have seen positive results from their efforts to implement the Ph.D. model.

- Kazakhstan adopted the Ph.D. model in 2011 and has the largest number of Ph.D. students in the region (see Table 3.2). In 2021, 74 HEIs out of 122 in the country were offering Ph.D. programs.¹³⁸
- Since 2020, Kyrgyzstan has gradually moved towards a three-cycle degree structure (bachelor's-master's-Ph.D.), but it is not clear yet whether it will co-exist with the Soviet model or fully replace it.

¹³⁴ Government Resolution of the Kyrgyz Republic “On establishing the amounts of scholarships for students and trainees of state educational institutions of primary, secondary and higher vocational education in the Kyrgyz Republic”, URL: <http://cbd.minjust.gov.kg/act/view/ru-ru/56382?cl=ru-ru>

¹³⁵ Government of Uzbekistan. (2017). Presidential decree of the Republic of Uzbekistan no. PF-4958 ‘On further improving the system of postgraduate training’. URL: <https://lex.uz/uz/docs/3119699>

¹³⁶ Ruziev, K. and Mamasolieva, M. (2022). Building University Research Capacity in Uzbekistan. In: Chankseliani, M., Fedyukin, I., Frumin, I. (eds) Building Research Capacity at Universities pp 285–303. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-12141-8_13

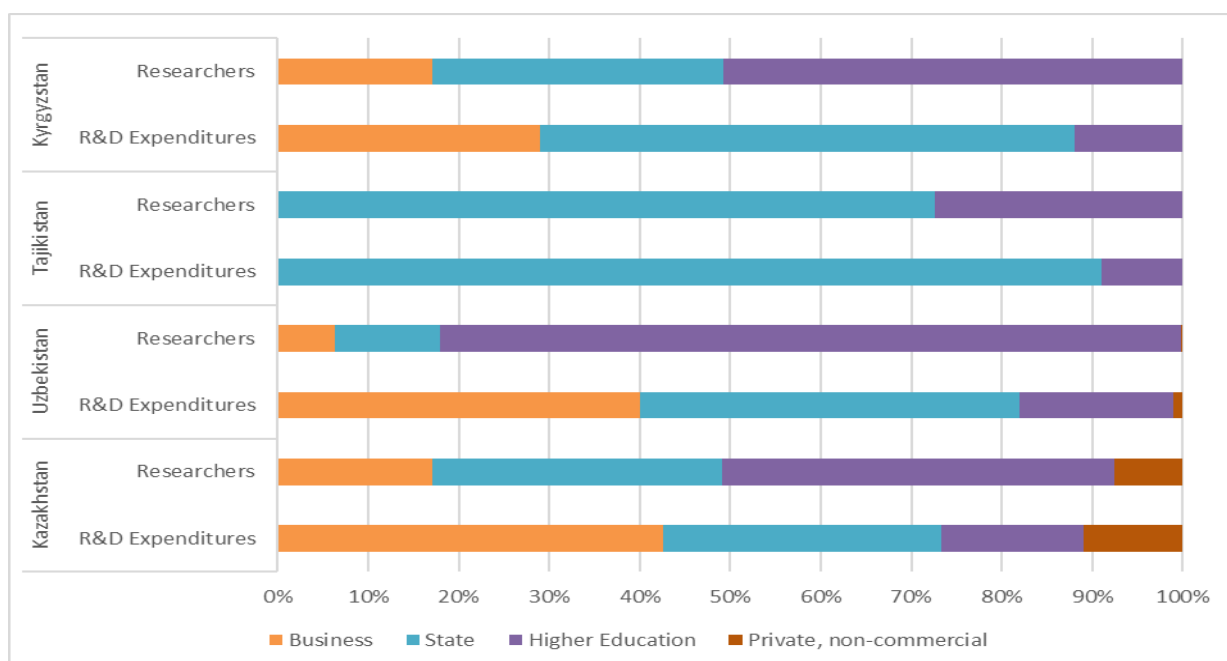
¹³⁷ On activities of SAC of Kyrgyz Republic for 2021, URL: <https://vak.kg/wp-content/uploads/2022/05/NAK-PKR-Otchetnyj-doklad-2021.pdf>

¹³⁸ Data from the Bureau of National Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

- Since 2014, Tajikistan allows both Candidate of Science and Doctor of Science degrees, but also Ph.D., as well as the habilitation. The number of Ph.D. students has increased from 253 in 2017 to 1,296 in 2021.¹³⁹
- After a period of co-existence between the Candidate of Sciences and Ph.D. degrees, Uzbekistan fully replaced the Candidate of Sciences degree with the Ph.D. in 2016, resulting in a six-fold increase in Ph.D. graduates from 2016 to 2021.¹⁴⁰ The standalone Doctor of Science degree was preserved.

Despite these efforts, doctoral training has not yet been able to significantly increase the research productivity of Central Asian countries. Ph.D. education is mainly focused on training scientists to replace the current university personnel, rather than on preparing highly qualified employees who can pursue employment outside of academia and contribute to innovative technological solutions in the business sector. As a result, the vast majority of researchers in the region continue to work at HEIs and research institutes in the public sector (see Figure 3.4).

Figure 3.4. Gross domestic R&D expenditures and the number of researchers by sectors, % (2018)



Source: Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

D. Linkages to the Industry and Technology Transfer

Insufficient investments in R&D and low demand for university-developed technologies are linked to the economic specialization of Central Asian countries. On average, the manufacturing sector in the region lacks innovation and research intensity, which is an important obstacle to the development of university R&D. In terms of economic complexity rankings, Central Asian countries lag significantly behind even lower-middle income countries and have not increased the value added of knowledge and technology in their exports base.¹⁴¹ While high-tech products account for one third of Kazakhstan's exports of processed goods, in Kyrgyzstan they account for 13% only (2021), and about 1% in Tajikistan and Uzbekistan (2020).¹⁴² The state dominance in the economy and the lack of market competition provide limited incentives for businesses to increase their competitiveness through innovations. Thus, the region has not developed a critical mass of advanced businesses that can drive high demand for innovation and

¹³⁹ Agency on Statistics under President of the Republic of Tajikistan. (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe

¹⁴⁰ State Committee of the Republic of Uzbekistan on Statistics. 2022. Main Statistical Indicators of Science and Innovation in the Republic of Uzbekistan. URL: https://stat.uz/images/inovatsiya_110822_anglizki.pdf

¹⁴¹ Observatory for Economic Complexity, 2020. Country Rankings (ECI). URL: <https://oec.world/en/rankings/eci/hs6/hs96>

¹⁴² World Bank database. High-technology exports (% of manufactured exports). URL: <https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS>

developments. Although science-driven production clusters have started to emerge, the efficiency of existing investments in innovation remains low. Uzbekistan, Kazakhstan, and Kyrgyzstan rank low in terms of the ratio between the volume of innovative products and investments in R&D.¹⁴³ In addition, technology transfer in the region is constrained by low entrepreneurial culture, placing Central Asian countries far behind high-income countries.¹⁴⁴

Research at Central Asian universities tends to focus on incremental innovations rather than on disruptive technologies. Experts note that existing research projects in the region usually develop incremental innovations (improvements in existing selected processes or technologies) or aim at resolution of some current operational problems.¹⁴⁵ At the same time, scientific and technological solutions for modernizing economies, structural changes and shifting towards high value-added industries are lacking.¹⁴⁶ Despite some rare exceptions, regional industries are still primarily composed of sectors with low level of technological advancement, and university science lags behind even in those sectors.

The academic community in Central Asia has limited interaction with the production sectors, resulting in a disconnect from the needs of the economy. The transition towards a market economy has disrupted the cooperation mechanisms between science and industry, which were previously based on close relationships between large sectoral state-owned enterprises and sector-oriented academic institutes. The decline in subsidies to state-owned enterprises, coupled with their new orientation towards generating market revenue, has changed priorities of businesses, and led to the loss of such collaboration. Meanwhile, HEIs have yet to establish alternative and effective models for interacting with the private sector.¹⁴⁷ There is little evidence of systematic engagement of businesses in the development of higher education curricula, research internships, or the identification of research topics for postgraduate students. Existing cases of cooperation between universities and large state-owned enterprises represent closed innovation ecosystems and are limited in scope.¹⁴⁸

The private sector in Central Asia rates cooperation between universities and industry as poor, with weak communication and a lack of mutual trust. According to surveys conducted by the World Economic Forum, businesses in the region evaluate the interaction between universities and industry as poor (corresponding indicator's score is from 2.7 in Kyrgyzstan to 3.4 in Kazakhstan, while the maximum score is 7¹⁴⁹). There is often a lack of applied disciplines at universities, while curricula do not correspond to the industry needs. Research supervisors are not aware of relevant industry needs, which affects the selection of research priorities and reduces the relevance of research results. In turn, this deters younger generations from pursuing scientific research work and an academic career.

Central Asian countries face significant obstacles in promoting cooperation between business and universities, particularly in the implementation of research projects.

- The key barriers for cooperation between universities and industry in Kazakhstan include inadequate financial resources at universities, the lack of commercialization offices and supporting staff, as well as high teaching load of the faculty.¹⁵⁰ R&D by Kazakh universities and sectoral research institutes are often not piloted and are not ready-to-use, which makes the private sector hesitant to invest in them.¹⁵¹

¹⁴³ Global Innovation Index (2022). URL: https://www.wipo.int/global_innovation_index/en/2022/ Note: ranking is performed based on the two sub-indices: a component that reflects innovative resources and a component that reflects innovative outcomes. Innovative resources sub-index measures indicators related to parameters of organizations, human capital and research, infrastructure, market development, and business development; while innovative outcomes sub-index measures the increase in knowledge and effectiveness from technological and creative perspectives.

¹⁴⁴ World Economic Forum. URL: [WEF_TheGlobalCompetitivenessReport2019.pdf \(weforum.org\)](https://www.weforum.org/reports/the-global-competitiveness-report-2019)

¹⁴⁵ UNECE. (2022). Innovation for Sustainable Development: Review of Uzbekistan. New York: United Nations Publications.

¹⁴⁶ National Report on Science, National Report on Science of the Republic of Kazakhstan, 2022

¹⁴⁷ World Bank. (2020). Modernizing Uzbekistan National Innovation System (Munis) Project. Report No: PAD3955. Finance, Competitiveness and Innovation Global Practice - Europe and Central Asia Region. Washington, DC: World Bank.

¹⁴⁸ UNECE. (2022). Innovation for Sustainable Development: Review of Uzbekistan. New York: United Nations Publications.

¹⁴⁹ The following question from the questionnaire was used: In your country, to what extent do business and universities collaborate on research and development (R&D)?" [1 = do not collaborate at all; 7 = collaborate extensively] | 2018–2019 weighted average or most recent period available Source: World Economic Forum, Executive Opinion Survey.

¹⁵⁰ Alibekova, G., Tleppayev, A., Medeni, T. D., & Ruzanov, R. (2019). Determinants of technology commercialization ecosystem for universities in Kazakhstan. The Journal of Asian Finance, Economics and Business, 6(4), 271–279.

¹⁵¹ Ministry of Science and Higher Education of the Republic of Kazakhstan, National Academy of Science of the Republic of Kazakhstan. (2022). National Report on Science Almaty-Astana.

- In Kyrgyzstan, the lack of regulation that would incentivize businesses to invest in university developments is seen as a significant barrier by experts. Moreover, many results of scientific research at universities and research institutes are not tailored to meet the needs of the real economy.
- Private funding of research is almost nonexistent in Tajikistan, according to official statistics.¹⁵² According to experts, when ordering research, businesses frequently bypass universities and instead hire individual researchers through short-term contracts for consulting services.
- In Uzbekistan, the contribution of the private sector to university research remains limited in absolute values in comparison to foreign countries. Despite recent efforts to expand partnerships between industrial enterprises and HEIs, the private sector is often hesitant to pay for research or invest in innovation, and cooperation is often conducted without formal contracts, leading to the loss of commercial benefits for universities.¹⁵³

There is a potential to increase business investments in university research and development. By collaborating with HEIs, businesses can access advanced technologies, gain valuable experience, and generate new ideas that can lead to the development of innovative products, services, and processes. Moreover, such partnerships enable the private sector to attract talented students teaching and research staff, as well as to use R&D infrastructure, resources and experience of universities. However, enterprises in Central Asia are currently making insufficient investments in research and development. Recent data shows that while business accounts for more than 40% of scientific research and development expenditures in Kazakhstan¹⁵⁴ and in Uzbekistan, this figure is close to one-third in Kyrgyzstan, and in Tajikistan almost all expenditures are borne by the public sector (see Figure 3.4.). In contrast, in Japan or South Korea, business accounts for almost 80% of R&D expenditures.¹⁵⁵

Despite significant potential, research results in the region are not being commercialized to their full potential and patent activity is declining. While patents do not necessarily lead to innovations, they are an indicator of capacity for research commercialization through licensing and spinoff-companies. Countries of the region have low positions in patent activity. In 2019, Central Asia accounted for only 0.06% of the global volume of patent applications and 0.06% of global registrations of industrial prototypes.¹⁵⁶ In comparison, Russia and Hungary, accounted for 0.9% and 0.04% from the total number of patent applications, respectively.¹⁵⁷ In relative terms, in 2020 patent activity in Kazakhstan amounted to 48 applications per million people, 11 in Kyrgyzstan, 10 in Uzbekistan, 0.4 in Tajikistan.¹⁵⁸ The majority of patents in all countries are received through the national patent agencies, while international patent activity remains low.¹⁵⁹ Moreover, patent activity has been in the decline in the region, with Kyrgyzstan and Kazakhstan seeing a reduction of almost 50% in patent applications between 2013 and 2020 (from 114 to 64 and 2,202 to 900, respectively). Uzbekistan, on the other hand, has maintained a stable level of patent activity (about 600 annually), with recent years showing significant growth. Finally, patenting practices remain uncommon in Tajikistan.¹⁶⁰

The lack of support instruments for patenting and intellectual property management poses a significant challenge to researchers in HEIs. Researchers do not have the necessary information and financial resources to submit patent applications, and there is a shortage of specialists in HEIs who can assist them with the process. In addition, patenting expenditures are also often borne by researchers and

¹⁵² Scientific and technical potential of the Republic of Tajikistan in 2019. Analytical Collection / Under the general ed. M.Kh. Ismoilzoda - Dushanbe, NPICenter, 2021 - p.102.

¹⁵³ UNESCO. (2021). UNESCO Science Report: the race against time for smarter development, URL: <https://unesdoc.unesco.org/ark:/48223/pf0000377433>

¹⁵⁴ According to 2022 data, the business accounts for 33.5% of expenditures. Source: On approval of the Concept for development of science in the Republic of Kazakhstan for 2022 - 2026 URL: <https://adilet.zan.kz/rus/docs/P2200000336#z54> On approval of the Concept for development of science in the Republic of Kazakhstan for 2022 - 2026

¹⁵⁵ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

¹⁵⁶ World Intellectual Property Indicators (2020). URL: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2020.pdf

¹⁵⁷ ibid

¹⁵⁸ World Intellectual Property Indicators (2020). URL: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2020.pdf

¹⁵⁹ For example, in 2021 Kazakhstan submitted 31 international applications (PCT), Uzbekistan - 3. Kyrgyzstan has submitted 4 international patent applications in 2020. According to the data from WIPO.

¹⁶⁰ Authors' calculations based on the data from the World Bank. The Total Patent Applications indicator includes international patent applications submitted according to the procedure of Patent Cooperation Treaty, or patent applications submitted to a national patent office. Aggregate application numbers for both the countries' residents and non-residents are provided. URL: <https://data.worldbank.org/indicator/IP.PAT.RESD> и <https://data.worldbank.org/indicator/IP.PAT.NRES>

undergoing a patenting procedure takes a long time. For example, in Uzbekistan patent registration takes from two to three years, registration of an industrial prototype – from one to two years.¹⁶¹ In addition, intellectual property management practices were preserved from Soviet times and have limited applicability, with no regulatory incentives to motivate scientists to engage in technology transfer or commercialization of their research.¹⁶² Moreover, academic career regulations even prevent the allocation of time by researchers for commercialization purposes.¹⁶³ The lack of successful role models of technological entrepreneurship in the region further exacerbates the problem.

Positive changes are noticeable in Uzbekistan. Researchers and research teams at universities can receive 40% and 30%, respectively, of the income generated by newly created innovative products. Furthermore, they can also expect receiving a bonus for getting an international patent.¹⁶⁴ Universities and research institutes are able to commercialize the results of their research through license agreements and joint ventures with commercial structures for the use of intellectual property rights. However, there is currently no legal framework to regulate technology transfer and provide a definition thereof.¹⁶⁵

Public investments in science are not focused on technology transfer and research commercialization. The total funding available for research and development activities in the region is insufficient and is in fact primarily used to subsidize employee salaries, rather than invest in technological development. State support for science is focused on research that rarely results in new, marketable products and technologies. For example, in Kazakhstan, 82% of competitive funding is allocated to fundamental and applied research, with only 18% allocated to R&D.¹⁶⁶ Experts indicate that despite the increasing transparency of grant allocation process in the last years, this mechanism still has deficiencies, including the concentration of grants among the same institutions and researchers who have not demonstrated the highest research outcomes. In 2022, in Uzbekistan only 10% of scientific research funding was allocated to research commercialization and 0.1% for R&D projects and prototyping.¹⁶⁷ According to expert survey, insufficient cooperation between enterprises and HEIs, and weak research commercialization were identified as the most critical challenges.¹⁶⁸

The development of technology transfer capacity is still in its early stages in Central Asian countries. According to international benchmarks, the university segment is significantly lacking in research and technology infrastructure, with an Infrastructure Readiness Index ranking below 95 out of 140.¹⁶⁹ Existing technology transfer infrastructure is largely limited to the national academies of science and is not usually well-integrated within leading universities.¹⁷⁰ As such, access to commercialization, legal, and financial consulting services is either non-existent or limited. Experts reported that services for establishing effective industry partnerships are insufficient, while scientific personnel lacks incentives to enter such collaboration. In parallel, universities often fail to systematically monitor contract research conducted for businesses and the state, and there are discrepancies in research commercialization and contract research rules across different HEIs and sectoral research institutes.

There is a shortage of specialists at universities who can effectively promote technology transfers. Scientists have limited knowledge about industry needs and lack the necessary competencies to search for partners, conduct negotiations, and prepare financial and legal documentation. As a result, this task is often delegated to vice-rectors, for whom this activity is not by far the main priority. University structural divisions (such as technology transfer offices) are often established formally, without sufficient staffing or

¹⁶¹ UNECE. 2022. Innovation for Sustainable Development: Review of Uzbekistan. New York: United Nations Publications.

¹⁶² Krouglov, Alex. 2022. "Modernisation of Higher Education in Uzbekistan: Transforming Quality Assurance System and Approaches", Society. Integration. Education: Proceedings of the International Scientific Conference. Volume I, May 27th, 2022, 148-156.

¹⁶³ World Bank. 2020. Modernizing Uzbekistan National Innovation System (Munis) Project. Report No: PAD3955. Finance, Competitiveness and Innovation Global Practice - Europe and Central Asia Region. Washington, DC: World Bank.

¹⁶⁴ UNESCO. 2021. UNESCO Science Report: The race against time for smarter development. Chapter 14: Central Asia. Chapter author: Y. Suleimenov. Edited by: Schneegans, S. Straza, T. and J. Lewis. Paris: UNESCO Publishing.

¹⁶⁵ Oqyulov, Omonboy and Abdulkhalil Tursunov. 2020. "Creating appropriate legal environment for technology transfer by foreign investors in Uzbekistan", *Solid State Technology*, 63(5).
<http://solidstatetechnology.us/index.php/JSST/article/view/9257>

¹⁶⁶ *ibid*

¹⁶⁷ National Report on Science and Innovations of the Republic of Uzbekistan for 2022.

¹⁶⁸ Kurbanbaeva, Nodira. 2020. Science, Technology, and Innovation (STI) Gap Analysis of Uzbekistan. Geneva: UNECE.

¹⁶⁹ *ibid*

¹⁷⁰ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing.

knowledge to perform their functions comprehensively. Accordingly, commercialization offices focus on formalizing documentation for existing projects financed by public resources, rather than actively engaging with businesses for new projects and other promising developments.

Central Asian universities must integrate into the national innovation ecosystems. For example, Kazakhstan has quasi-public organizations that provide grants for innovation development, such as the National Innovation Fund. In Uzbekistan, 15 technoparks have recently opened. Moreover, each country also has a broad network of free economic zones aimed at developing innovations and technologies. There are several successful examples of innovation infrastructure in Central Asian universities:

- Since the adoption of the Law “On commercialization of results of scientific and/or scientific and technical activities” in 2015 in Kazakhstan, the share of HEIs that have established commercialization offices, technoparks, business incubators, and laboratories has increased from 14% to 72%.¹⁷¹ Some successful examples of technoparks include the NURIS innovation cluster at Nazarbayev University and the Science and Technological Park of Al-Farabi Kazakh National University, where 25 startup-companies and six research centers operate together.
- Kyrgyzstan’s State Technical University named after I. Razzakov established a technopark together with two large industries and the German project “Professional Education for Economic Growth Sectors in Central Asia.”¹⁷² Nevertheless, experts note the lack of specialized information centers at universities, where researchers can receive required information, as well as advice on utilizing research results. To address this, Kyrgyzstan launched a new project to support development of business incubators and startup-centers at universities: there are currently 32 HEIs hosting startup-centers and it is planned that business incubators selected on competitive basis will receive grants of up to 100 million KGS for project implementation.¹⁷³
- Tajikistan has a state business incubator with five branches that provides advisory support on commercialization of ideas and developments. According to the National Innovation Internet Portal of Tajikistan, technoparks are operating in 23 HEIs.¹⁷⁴ However, experts say that many technoparks are not performing active R&D work, but rather focused on the sale of non-core services and continuous professional development programs.
- Innovation technoparks in Uzbekistan have only started to develop as well. For example, starting in 2022, AKFA University and INNO Technopark together with Yeungnam University and Gyeongbuk Technopark (South Korea) will jointly support startup development and specialist training of specialists.¹⁷⁵ It is planned to open in the near future the “Center for Perspective Projects and Engineering” and “Investor Support Center” technoparks.¹⁷⁶

¹⁷¹ Ministry of Science and Higher Education of the Republic of Kazakhstan, National Academy of Science of the Republic of Kazakhstan. (2022). National Report on Science Almaty-Astana.

¹⁷² Technopark of KSTU named after I. Razzakov, URL: <https://kstu.kg/technopark>

¹⁷³ AKIpress News Agency, URL: <https://bilim.akipress.org/ru/news:1811459/?f=cp>

¹⁷⁴ National Innovation Internet Portal of Tajikistan, URL: <http://innovation.tj/2022/05/10/tehnologicheskie-parki-respubliki-tadzhikistan/>

¹⁷⁵ UZ Daily. URL: <https://uzdaily.uz/ru/post/71030>

¹⁷⁶ CIS Internet Portal. URL: <https://e-cis.info/news/569/104144/>

Regional Integration in Higher Education

Support from Western and Asian countries have been the key driver for international cooperation in higher education and science in Central Asia. Many international organizations have provided financing for the development of higher education, including the World Bank, USAID, TEMPUS, ERASMUS, DAAD, GIZ, MEXT, JASSO, British Council, and many others. The Erasmus+ program and its predecessors (Tempus and Erasmus Mundus) have made an outstanding contribution to strengthening the connections between HEIs in Europe and Central Asia, while also stimulating academic mobility and the harmonization of the education space. According to data from Erasmus+, in 2014-2020, about 400 students from Central Asia have won scholarships under Erasmus Mundus Joint Master's Degrees to study in Europe, and about 6,000 students and academic staff have participated in the international credit mobility programs in Europe.¹⁷⁷

Central Asian universities are active in terms of bilateral cooperation; however, such cooperation is concentrated outside the region. In Kazakhstan, new universities have been established in partnership with the United Kingdom, Germany, Türkiye, or Russia. In Uzbekistan, both private and public universities from the United Kingdom, Russia, Singapore, Italy, or South Korea, were opened. Foreign partners, for example, the United States, Türkiye and Russia, founded a significant number of reputable HEIs in Kyrgyzstan. At the same time, several Central Asian universities have close partnerships with other HEIs in the region. For example, IITU (Almaty) has a close relationship with Inha University (Tashkent), or KBTU (Almaty) collaborates closely with BMU (Tashkent). AlmaU University (Almaty) has opened a branch in Tashkent, while Turan University (Almaty) has opened a new campus in Uzbekistan. In addition, in 2022, a branch of Al-Farabi Kazakh National University was opened in Kyrgyzstan.

Despite various attempts to promote greater intra-regional cooperation in higher education (see Box 1), several obstacles have hindered the success of these initiatives. Firstly, international programs aimed at the region are often fragmented or short-term in nature, failing to address regional priorities. As a result, they tend to facilitate bilateral partnerships between individual Central Asian countries and foreign partners, rather than promoting wider regional collaboration. Secondly, the benefits of such cooperation are not usually sustainable, with many projects ending once grant funding expires. Thirdly, joint scientific projects have proven particularly challenging to establish, given the significant financial investment required, a lack of appropriate regulatory frameworks, and limited external incentives.

In this context, Central Asian countries have shown an increasing interest in regional cooperation and integration in higher education. A new phase of cooperation in higher education was launched in 2021 with the endorsement of the Turkestan Declaration by Kazakhstan, Kyrgyzstan, Turkmenistan, and Uzbekistan, which aims to establish a Central Asian Higher Education Area. As of March 2023, Tajikistan has not signed the Declaration yet, although it was engaged in the negotiation process. The objectives of the Turkestan Declaration include the promotion of academic mobility, the recognition of diplomas across the region, the introduction of comparable qualifications frameworks, and the establishment of joint institutions for cooperation in higher education. The countries have also agreed to establish the following regional cooperation instruments:

- Alliance of Central Asian Universities which will facilitate joint projects in science and education, mobility programs, and the opening of foreign university branches,
- Association of Qualifications Recognition Organizations,
- Central Asian Education Quality Assurance Network,
- Students' Alliance.

¹⁷⁷ According to data of Erasmus+ (2020), Uzbekistan, URL: https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/asia-central/uzbekistan_erasmusplus_2020.pdf; Kyrgyzstan, URL: https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/asia-central/kyrgyzstan_erasmusplus_2020.pdf; Kazakhstan, URL: https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/asia-central/kazakhstan_erasmusplus_2020.pdf; Tajikistan, URL: [Erasmus+ and higher education in Tajikistan \(europa.eu\)](https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/asia-central/tajikistan_erasmusplus_2020.pdf); as well as EU-Central Asia academic cooperation through Erasmus+ (2019), URL: https://erasmus-plus.ec.europa.eu/sites/default/files/centralasia-regional-erasmusplus-2019_en.pdf

Box 1. Central Asia’s Efforts for International Integration in Higher Education

Central Asian HEIs have employed various measures to integrate internationally, such as faculty and student mobility, joint research, educational programs, and the organization of scientific conferences and Olympiads. In addition, membership in university associations and unions is a crucial component of their efforts. The following are some of the prominent initiatives:

Eurasian Association of Pedagogical Universities: The first intergovernmental public organization aimed at supporting the integration in education and science in the Eurasian Economic Community. The Association was founded by the Abai Kazakh National Pedagogical University and the Moscow Pedagogical State University. Every two years, the Association organizes an international competition for young faculty members of CIS member states. The winner of the competition receives a fully funded internship abroad.

Eurasian Universities Union: This Union brings together more than 120 HEIs from Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan and Ukraine. The Union organizes regular conferences, forums, publication of thematic monographs.

Association of Asian Universities: This Association unites 27 universities from eight countries and aims to establish a unified Asian education area. The Association organizes international summer schools on Asian ethnography, student forums, and publishes as well an academic journal “Society and Security Insights” (included in RSCI, ERIH PLUS).

University of Shanghai Cooperation Organization: The *SCO University* functions as a network of HEIs in SCO member-states (Kazakhstan, China, Kyrgyzstan, Russia, Tajikistan, Uzbekistan) and observer states (India, Iran, Mongolia, Pakistan). The University’s primary mission is to implement joint educational programs (including in distance learning format) among network members in priority areas, such as regional studies (implemented by 32 HEIs), IT (29 HEIs), nanotechnologies (16 HEIs), energy (21 HEIs), ecology (25 HEIs) and pedagogy (12 HEIs).

Source : <http://euapu.ru/>, <https://aauniv.org/>, <https://uni-sco.ru/>

Table 3.5. Key Challenges and Opportunities in Regional Integration in Higher Education

Key Challenges	Opportunities
<ul style="list-style-type: none"> • Disparities in economic development and in higher education systems restrain joint actions and shared strategic vision at regional level. • Weak global reputation of universities, lack of credible quality metrics and poor awareness of collaboration opportunities lead to mutual mistrust and limited interest in cooperation between Central Asian countries. • There is no harmonized Central Asian higher education area due to differences in curricula and awarded qualifications, lack of mechanisms for transferring learning outcomes and for recognizing diplomas and degrees. • Language barriers, non-optimal migration laws and a lack of support tools do not foster academic mobility within and outside the region. • Countries suffer from brain drain, sending more students to study abroad than they attract, and have limited economic and academic advantages from internationalization. 	<ul style="list-style-type: none"> • Defining common challenges that are more cost-efficient to solve at regional level. • Synchronizing strategic priorities in higher education. • Developing organizational bodies and communication platforms to facilitate regional cooperation between Central Asian countries and universities. • Harmonizing national qualifications frameworks and principles for the recognition of learning outcomes. • Building a regional brand to attract international students and supporting intraregional mobility. • Developing seamless and flexible educational and professional trajectories by digitizing and aggregating acquired experience, skills, and competencies.

A. Regional Cooperation in Higher Education

One of the primary obstacles to fostering regional cooperation in higher education and science is the lack of consistent strategic vision at the regional level. Each country in the region has its own set of priorities, which are often share similar goals and objectives, but can be different in their implementation arrangements, resulting in a lack of shared plans for interregional cooperation. However, a shared orientation towards integration into the global higher education arena could serve as a common denominator for mutual alignment of institutions and procedures for higher education development.

A significant challenge to regional cooperation is the relatively weak reputation of universities in the region, which limits incentives for cooperation. Experts have noted a continued lack of trust between national higher education systems in Central Asia, often due to the perception that universities in the region have low academic and research quality. Moreover, the absence of transparent quality assurance systems in higher education has led to a tendency to seek cooperation and integration beyond the region. In general, regional research centers within universities also have a poor reputation and are rarely considered as potential partners for joint research projects. Experts suggested that the benefits of cooperation within the region are not fully clear to research and administrative staff at universities, explaining why they instead focus on cooperation with institutions from high-income countries.

Different levels of economic development and disparities in higher education systems represent a barrier for cooperation. As indicated previously, there are significant differences in infrastructure, human resources, and funding between Central Asian countries, hindering investments in joint education and science projects and programs within the region. Moreover, Central Asian countries mainly allocate their education and science budgets to current expenses, leaving few resources available for collaboration. Thus, there are almost no programs that provide funding to joint projects targeted at cooperation exactly within the region. Additionally, the state order system for educational services does not prioritize academic mobility and cooperation between Central Asian countries. The issue of funding activities related to regional integration in higher education is not addressed in the Turkestan Declaration, despite ambitious plans to expand cooperation.

Improved information dissemination could help countries to adequately assess opportunities for cooperation. In general, experts indicate poor awareness among Central Asian universities about cooperation opportunities with one another, a lack of unified space for information exchange, and a limited adoption of successful practices and achievements of regional HEIs. This limited interest in regional cooperation is also driven by the scarcity of objective information on both weaknesses and strengths of higher education systems in the region. Central Asian countries are underrepresented in international higher education monitoring and the majority of HEIs in the region are not included in highly competitive global rankings. Indeed, these rankings often rely on expert survey data, which Central Asian HEIs lack, putting them at a disadvantage compared to foreign universities with similar quality but longer histories of participation in rankings. Meanwhile, Central Asian countries have not made significant efforts to establish their positioning within and beyond the region. The lack of comprehensive data prevents the adequate assessment of individual countries and results in an underestimation of the benefits of investing in intra-regional cooperation.

Central Asian HEIs have demonstrated limited interest in launching joint educational programs. According to experts, even leading universities in the region are struggling to compete with their counterparts in high-income countries when it comes to establishing joint educational programs. This is due to a variety of factors namely, differences in accounting for educational credits, varying levels of implementation of Bologna Process principles, and different levels of demand for higher education. The rigidity of education formats, inflexible regulation and standardization of education process requirements further impede cooperation. For example, a mixed education model, combining in-person and online classes, is not used to the full extent for joint degrees, despite its potential to reduce mobility barriers.

Regional cooperation between research centers has a significant potential for growth. Research activities at HEIs are currently fragmented and rely heavily on the availability of external one-time financing, which does not promote sustainable cross-country cooperation. Universities in the region usually lack an understanding of best practices for developing inter-university academic programs and have not developed resource sharing arrangements and regulations. Similarly, research resources are primarily allocated to expensive cooperation with more developed countries. While Central Asian scientists have

considerable potential for cross-country collaboration, their co-authors tend to be from the United States, Germany, Türkiye, and Russia, with few Central Asian scientists represented.¹⁷⁸

B. Connectivity of Educational Space

The lack of harmonization among Central Asian higher education systems poses a significant challenge to regional cooperation. Although Kazakhstan is the only formal member of the Bologna process, other countries in the region are also making efforts to align their higher education systems with the Bologna Principles. However, there is still untapped potential for better mobility, mutual recognition of qualifications, and improved quality assurance processes. The harmonization of the educational space is hindered by several systemic constraints, including lack of information and trust, the absence of political support, differences in strategic priorities in higher education, poor implementation of already reached agreements, as well as bureaucratic hurdles and large differences in the quality education both within and across countries.

Actions were taken in Central Asia to simplify procedures for the recognition of diplomas and academic degrees. In 1998, an Agreement was signed between Kazakhstan, Kyrgyzstan, Tajikistan, Russia and Belarus on the mutual recognition and equivalence of academic credentials and academic degrees. This Agreement allows for the recognition of higher education diplomas, including those for bachelor's, specialist, and master's programs, in case of continuing education in these countries. However, it is stipulated that the educational institutions that issued a diploma must meet the criteria established by national authorities for mutual recognition of academic credentials. Moreover, according to the Treaty on the Eurasian Economic Union, in case of employment in those countries, diplomas of member countries are valid without undergoing procedures for recognition. However, Uzbekistan and Turkmenistan have not acceded to the collective agreement on mutual recognition and equivalence of academic credentials and academic degrees. Uzbekistan is not a party either to the Treaty on the Eurasian Economic Union on recognition of diplomas in case of employment.

In practice, the recognition of academic credentials from foreign countries often requires time-consuming procedures. In Kazakhstan, nostrification takes up to four months,¹⁷⁹ and sometimes longer depending on the speed of diploma authenticity confirmation by foreign bodies. If academic credentials do not meet state standards, applicants are required to take a test. However, there are simplified procedures in place for the recognition of diplomas from Central Asian countries,¹⁸⁰ as well as an automatic recognition of academic credentials awarded by universities listed among the top 250 institutions in international academic rankings (QS, ARWU, THE). Moreover, recipients of the “Bolashak” scholarship are exempt from diploma recognition procedures. In 2019, Uzbekistan simplified its recognition procedure by reducing processing times and introducing an online service for document submission. Applicants now only need to complete an online application, pass an interview, or take a test, depending on their specialization. Graduates from universities that are accredited members of ENQA, universities of selected countries (such as the United States, Australia, and Israel), as well as universities included in the list of the top 1000 universities in the QS, THE, and ARWU rankings are exempt from special examinations for diploma recognition.

Despite efforts to align standards, significant differences in curricula and awarded qualifications still exist. A key constraint for the integration of Central Asian higher education systems is the lack of framework for the standardization of curricula, with similar programs varying in qualifications awarded, teaching load, and content. The absence of a unified classifier of professions and common guidelines for assessing learning outcomes further complicates the matter, resulting in similar academic programs having different educational outcomes. In addition, HEIs in the region have low autonomy in designing educational programs and must comply with rather rigid educational standards. Mandatory state components in educational programs differ by scope and content in different countries of the region. Except for

¹⁷⁸ Ovezmyradov, B., & Kepbanov, Y. (2020). Comparative Analysis of Higher Education and Research in Central Asia from the Perspective of Internationalization. *Central Asian Law: Legal Cultures, Governance and Business Environment in Central Asia*, 25.

¹⁷⁹ Order of the Minister of Education and Science of the Republic of Kazakhstan No. 352 dated July 19, 2021.

¹⁸⁰ A simplified procedure is provided for the countries who have signed the CIS Agreement “On Cooperation in Education” dated May 15, 1992.

Kazakhstan, Central Asian countries, and especially Tajikistan, maintain a substantial portion of specialist 5-year programs, creating additional difficulties for harmonizing educational programs requirements.

Opportunities for mutual recognition of learning outcomes are limited, with no regulatory framework at the state or university level for the seamless transfer of students' achievements. There is a lack of institutionalized procedures and practices for transferring students from one educational institution to another within the region. Experts agree that mutual recognition of academic achievement is more of an exception that requires individual agreements and special conditions, rather than a widely accepted and streamlined mechanism. Usually, the recognition of completed courses requires a signed agreement between universities and concerted efforts to harmonize educational programs at the university level, which is still uncommon in Central Asian countries. Due to differences between higher education systems, leading universities in the region may not recognize other HEIs in Central Asia as partners capable of ensuring comparable quality of education. That is why requirements for the recognition of education results obtained in Central Asian HEIs are usually stricter than those for universities outside the region, often involving excessive documentation and full alignment of learning outcomes in partner university, which may not be feasible in most cases.

Although all countries in the region have announced the adoption of educational credits compatible with ECTS, the system has yet to be implemented on a regional scale, and there are national variations in its application. All higher education systems in the region are formally aligned with ECTS and educational credits are indicated in diploma supplements. Moreover, a credit-modular system was introduced in some universities of the region under the “Tuning” project that covered 41 universities from EU countries, Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan. However, this system is not yet widely adopted and differs in its application across the region. For example, Uzbekistan plans for 85% of HEIs in the country to transition to the credit-modular system only by 2030,¹⁸¹ while Tajikistan introduced changes in curricula and program structure to develop credit-modular system only in 2022.¹⁸² In addition, the number of approved academic hours per one credit varies among Central Asian countries, which further limits the recognition of diplomas and cooperation based on ECTS. For example, 1 ECTS is equal to 30 hours for Kazakhstan, 30 hours for Kyrgyzstan, 24 hours for Tajikistan, and between 25 and 30 hours for Uzbekistan.

The credit-modular system in the region (except for Kazakhstan) has not significantly enhanced opportunities for flexible educational trajectories. Education remains tied to regulatory education periods, rather than earned credits, and there is limited possibility for students to study beyond the specified timelines through earning credits. According to experts, the credit-modular system has yet to become an instrument that facilitates mobility within and between Central Asian countries. Therefore, additional efforts are necessary to standardize the system of academic credit and develop policies that will enable cross-border recognition of learning outcomes.

C. Internationalization and Intra-regional Mobility

The level of internationalization in Central Asian countries varies significantly. Kazakhstan and especially Kyrgyzstan have consistently increased inbound student mobility and demonstrated high growth rates in the share of foreign students in tertiary education. Meanwhile, Tajikistan and Uzbekistan have lower levels of internationalization than global averages and have not been increasing the inbound student mobility recently (see Figure 3.5.). Although both countries have made efforts to attract international students, additional actions are necessary to catch-up with their neighbors.

Internationalization in Kyrgyzstan is an example of successful policy for attracting international students. In recent years, Kyrgyzstan has outpaced many high-income countries in terms of inbound mobility, with approximately 25% of university students coming from abroad in 2021 (refer to Figure 3.5). The cost of education, which is lower than in other countries in the region, has been an important factor in this success. Moreover, the country has good academic positioning due to selected centers of excellence, such as AUCA or UCA. In addition, many people living in border areas of Uzbekistan, Tajikistan, and Kazakhstan choose to attend HEIs in Kyrgyzstan for their education. Finally, an important factor

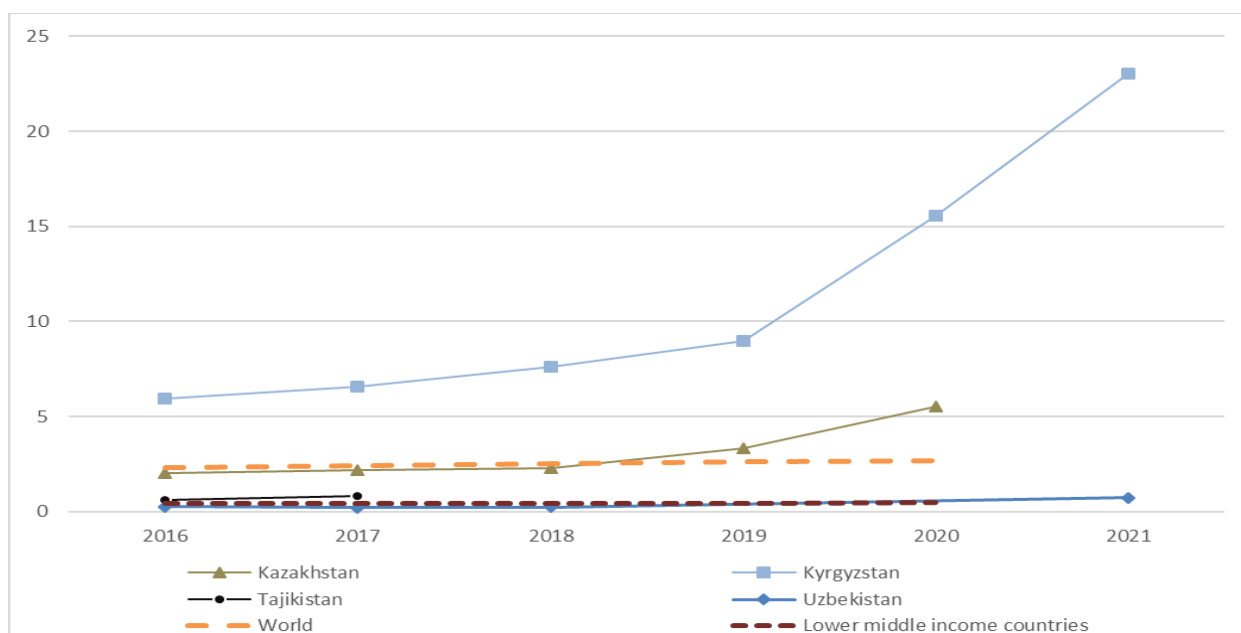
¹⁸¹ Government of Uzbekistan (2019). Concept for the development of the higher education system of the Republic of Uzbekistan until 2030. <https://lex.uz/docs/4545884>

¹⁸² “State standard for the higher vocational education in the Republic of Tajikistan,” with changes and amendments, introduced by the Resolution of the Government of the Republic of Tajikistan No. 562 dated 29.11.2022.

contributing to Kyrgyzstan’s success has been the policy to open medical programs and even new universities targeting students from Pakistan and India.

Central Asian states are an important source of inbound student mobility for one another. Recent data from 2019 reveals that Central Asian students accounted for 40% of international students in Kyrgyzstan and Uzbekistan, and 60% in Kazakhstan (see Figure A.5.). Additional Russia, Pakistan, India and China are significant contributors of inbound students in Central Asia. When considering mobility within Central Asia, Kazakhstan and Kyrgyzstan emerge as the primary recipients of intraregional mobility, attracting a substantial share of inbound mobility from other Central Asian countries, while simultaneously sending the majority of their own students to countries outside the region. Uzbekistan, on the other hand, experiences relatively lower inbound mobility from Central Asia, but serves as a key provider of international students to other countries in the region (Table A.2).

Figure 3.5. Share of foreign students in the total number of tertiary education students, % (2016-2021)



Source: UIS statistics.

Russia remains the main destination country for outbound student mobility from Central Asia. In fact, 78% of students from Kazakhstan who leave to study abroad go to Russia. This trend is also evident in Kyrgyzstan and Uzbekistan, where 54% and 31% of outbound students, respectively, choose Russia as their destination.¹⁸³ The reasons for this is not only a comparatively better quality of education but also employment opportunities. Uzbekistan is the only country in the region where Central Asian countries are the primary educational mobility destination for students, rather than Russia or other regions in the world. Indeed, in the last years, the country has experienced an impressive growth in outbound mobility, which was mainly directed towards other Central Asian countries – in fact, 50% of outbound students from Uzbekistan study in Central Asia, which represents close to 75% of intra-regional mobility.

Except for Kyrgyzstan, all countries in the region have net deficit in international students’ mobility. Uzbekistan and Kazakhstan are losing 7% of their students, while Kyrgyzstan’s net mobility deficit is over 11% (see Table A.2.). The problem is further compounded by the region’s net deficit of labor migration and low intra-regional mobility (see Annex B). However, the situation has substantially improved in some countries. From 2016 to 2020, Kyrgyzstan has increased the net mobility of students by seven times, while Kazakhstan nearly doubled its own. Tajikistan and Uzbekistan maintained a more or less stable level of deficit.¹⁸⁴

The current internationalization strategy pursued by Central Asian countries is primarily based on offering education with low tuition fees for neighboring countries. Currently, Central Asian countries

¹⁸³ ibid

¹⁸⁴ ibid

base their internationalization strategy on offering low tuition fees and low costs of living. However, this strategy fails to prioritize quality and talent acquisition. Although foreign students value the possibility to study in Russian or English, their primary interest lies in the affordability of the study programs and the comparatively lower admission requirements. However, this approach leads to limited economic and academic benefits from internationalization. Central Asian countries import relatively weaker students from neighboring countries, while talented students are leaving the region. This trend exacerbates brain drain and diminishes the region's participation in the global talent market. To address this challenge, countries in the region must adopt a more balanced internationalization strategy that attracts strong students from outside the region and fostering mobility within the region. Recruiting international students to graduate programs that is rare in the region now should be a particular priority. By fostering stronger academic exchange and creating more attractive opportunities for talented students, the region can better position itself in the global talent market.

There is a lack of financial support mechanisms for student and faculty mobility in Central Asia, hindering intraregional mobility. In order to intensify intraregional mobility, additional state support is needed, including through the provision of grant-based support and subsidies for academic mobility. Additionally, experts also indicate that university applicants in Central Asian countries have limited awareness of the mobility opportunities available within the region, as well as admission procedures and accommodation options. It is worth noting that no mobility program targeted at regional students or faculty exists in Central Asia, unlike other regions with established programs like Erasmus+ and AIMS (see Box 7).

Academic staff mobility between countries in the region is not common and there are limited opportunities to finance inbound academic mobility for researchers. From a regulatory perspective, HEIs face limitations in using financing to encourage mobility on a regular basis outside special programs. Mobility programs are often highly bureaucratized and constrained by low research culture and high classroom teaching load. Another barrier is the large difference in remuneration across countries in the region. Moreover, there are virtually no academic mobility support programs for Ph.D. students and postdoctoral fellows, even though such initiatives are critical for developing research capacity in Central Asia.

Optimization of migration legislation can facilitate higher education mobility. Foreign students are required to register at their place of residence and with the migration office, which can be inconvenient for those who need to submit documents or pass entrance examinations. Applicants from Central Asia can reside for up to one month without registration in Tajikistan. Annual visa extension is usually required for students (except for those from Kazakhstan, Belarus, and Russia).¹⁸⁵ In Kyrgyzstan, students are issued a primary visa for up to 3 months, and annual visa extension are necessary. In Kazakhstan, registration is usually valid for up to six months, and must be renewed after every departure from and return to the country. These visa requirements and registration procedures can be cumbersome and may discourage foreign students from studying in the region.

Language barriers are also a significant obstacle to academic mobility in the region. Many HEIs in Central Asia use the national language as the official language of instruction, with a limited number of courses is taught in Russian, and only a few courses in English. For example, at the beginning of 2021-2022 academic year, 17% of students in Tajikistan were studying in Russian, 1.5% in English, and 0.5% in Uzbek.¹⁸⁶ In the 2019-2020 academic year in Kazakhstan, 65% of students were studying in Kazakh, 30% in Russian, and 5% in English.¹⁸⁷ These language barriers can hinder international students' ability to access educational opportunities in the region.

¹⁸⁵ Ministry of Foreign Affairs of the Republic of Tajikistan, Main Consular Department

¹⁸⁶ Education in the Republic of Tajikistan / Statistical Yearbook / Agency on Statistics under President of the Republic of Tajikistan. - Dushanbe: 2022. – p. 93.

¹⁸⁷ Data from the Bureau of National Statistics of the Ministry of National Economy of the Republic of Kazakhstan, URL: <https://stat.gov.kz/>

IV. Policy Recommendations and Roadmap for Higher Education Integration and Development

This Section presents the Roadmap recommendations for the development and integration of higher education systems in Central Asia. These recommendations are targeted to the common national challenges outlined above and mainly propose regional and collaborative solutions to address them that would involve cooperation between several Central Asian countries. Indeed, many of these obstacles could be effectively addressed collectively at the regional level, supporting economies of scale, exchange of best practices and greater impact. In fact, integration and regional cooperation have the potential to be key enablers to higher education development in the region, fostering improvements in quality, relevance, and innovation in the sector. As such, the section starts by outlining the General Institutional Prerequisites in financing and governance that are crucial for the effective implementation of the proposed recommendations. Recommendations are then presented and organized into 10 strategic pillars, which are grouped into three priority policy areas:

1. Improving access, quality, and relevance of higher education,
2. Strengthening research and innovation capacity,
3. Advancing instruments for an integrated regional higher education area.

These pillars were developed as the key objectives of the Roadmap and identified based on national strategic goals in higher education (see Section II for more details).

Each strategic pillar contains recommended projects and actions, presented in priority order. The following criteria were used for prioritization. First, the recommendation must be able to address the largest number of challenges identified earlier (as demonstrated in Table E.1.). Second, it should be scalable at the regional level through horizontal cooperation and engagement with a broad range of partners. Finally, prioritization considers as well resource capacity and timeline for implementation. As such, the actions with the highest priority are those that provide substantial synergy from regional cooperation, address a large number of challenges and have important potential returns on investments in the short- and medium-term. The second priority actions include those that meet at least one of the above criteria. The third priority actions are aimed at supporting and completing other actions or those that have significant resource requirements. Key recommendations are summarized in Table 4.1.

Table 4.1. Key policy recommendations for the development of higher education in Central Asia

Strategic Pillars	Key Policy Recommendations
Priority Policy Area I. Improving access, quality, and relevance of higher education	
Pillar 1.1: Ensuring external and internal quality assurance	<ul style="list-style-type: none"> • Develop regional accreditation standards • Promote effective internal quality assurance tools • Establish the Central Asian Accreditation Agency • Increase the attractiveness and effectiveness of the teaching profession • Account for social indicators in funding formulas and loans for higher education • Promote distance/virtual higher education • Forecast regional labor market; establishing graduates tracking systems; developing green and digital skills • Develop regional cooperation platform for universities and the industry
Pillar 1.2: Enhancing the effectiveness and the quality of teaching	
Pillar 1.3: Widening participation and access to higher education	
Pillar 1.4: Ensuring the relevance of higher education	
Priority Policy Area II. Strengthening research and innovation capacity	
Pillar 2.1: Increasing research productivity of academic staff	<ul style="list-style-type: none"> • Providing financial and non-financial incentives to conduct and publish quality research results • Strengthening publication infrastructure • Establishing a network of centers of excellence in priority areas for economic development • Launching a regional competitive fund to support research and cooperation between HEIs and research institutes • Modernizing scientific personnel training, with the full implementation of the Ph.D. model • Expanding technology transfer and integrating universities in emerging national innovation ecosystems • Developing new cooperation formats and incentives for industry and universities
Pillar 2.2: Building research capacity and excellence in higher education institutions	
Pillar 2.3: Strengthening linkages between universities and industry	
Priority Policy Area III. Advancing instruments for an integrated regional higher education area	
Pillar 3.1: Establishing regional cooperation infrastructure	<ul style="list-style-type: none"> • Aligning strategic priorities of higher education development among Central Asian countries. • Establishing a regional institutional framework: Central Asian Higher Education Council, Central Asian Regional Center for Higher Education and Skills, Association of Leading Universities of Central Asia. • Developing a Central Asian Short-Term Mobility Program • Developing effective mechanisms for the recognition of academic credentials, scientific degrees, and learning outcomes across Central Asian countries
Pillar 3.2: Harmonizing the higher education space	
Pillar 3.3: Enhancing internationalization and intra-regional mobility	

General Institutional Prerequisites: Financing and Governance

This section outlines the institutional conditions necessary to effectively implement the recommendations proposed below. These conditions are aimed at removing key barriers hindering the development of Central Asian higher education systems. First, providing additional funding for higher education systems, including from private sources, is necessary to supply the labor market with highly skilled professionals and to foster innovation. Moreover, additional investments should be dedicated to developing digital university infrastructure. Finally, improving governance and strengthening management capacity in the higher education sector is an essential prerequisite for implementing reforms and improving the performance of HEIs. While the implementation of these General Institutional Prerequisites necessitates significant resources and political support, they are expected to provide important benefits for the overall higher education system on the long term. However, this would require sustained and systematic efforts, primarily at the national level. Therefore, the recommendations in this section are presented as development trajectories, with potential solutions varying depending on the national context.

1. Attracting additional investments in higher education systems

Central Asian higher education systems are characterized by chronic underfunding – it is therefore necessary to gradually increase public funding up to the global average standards, at 1% of GDP. To achieve this, it is necessary to modernize the dual-track model. Increasing differentiation of public grant support and, correspondingly, of the tuition fee structure will enable the expansion of opportunities for attracting private resources considering different financial capacities of families. Public funding needs to incentivize private investments and be more responsive to students' learning outcomes, both during admission and university education. A successful model is Kazakhstan's financing arrangement, where grant support to university admission is awarded depending on students' learning outcomes.

The creation of endowments or the expansion of educational loans could also be a solution to improve the financing of higher education. Creating incentives for the establishment of endowments and facilitating other types of donations to HEIs. A regulatory framework with adequate tax incentives for the establishment of such funds, including transparent rules for using their proceeds and methodological support, is needed. Moreover, expanding educational loans could be a solution as well. This could be achieved by developing an effective market for support-oriented credit facilities, which is essential to increase the funding available in higher education systems in the region. In addition, developing and piloting income-shared agreements could be a promising instrument to finance higher education. Under these agreements, students receive funding for higher education in exchange for a percentage of their future income over a certain period. Positive experiences in Australia, the United Kingdom, New Zealand, and other countries on income contingent student loans are useful examples of sustainable and equitable student loan systems.

Finally, it is necessary to expand research funding, particularly for technological developments. R&D investments are key for developing a knowledge economy that relies on high-value-added sectors. Considering existing budget constraints, the main possible sources of financing are private investments from individuals and enterprises, public-private partnerships, increasing the level of competition between research institutions, and efficiently use of available resources. However, if businesses face high transaction costs and risks when investing in research, the state should step in and finance R&D to stimulate future private investment. For example, recent research in the United Kingdom has demonstrated that an increase in public expenditures for R&D by 1% led to increases in private investments ranging from 0.23% to 0.38% within the same year.¹⁸⁸

2. Developing digital infrastructure to improve resource efficiency and governance

The comprehensive development of digital environments in universities is essential to improving the quality of education and management of the higher education sector. Providing reliable and affordable access to broadband internet is crucial for all universities in the region (to a lesser extent in Kazakhstan) and to guarantee the success of any digital transformation project. Moreover, it plays a critical role in the

¹⁸⁸ Oxford Economics (2020). The relationship between public and private R&D funding. BEIS Research Paper Number 2020/010, URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897470/relationship-between-public-private-r-and-d-funding.pdf

advancement of distance education, particularly in areas where access to higher education needs improvement the most. The quality of internet connectivity is particularly low in regions that are most in need of better access to higher education. This creates a significant challenge in delivering high-quality online learning experiences to students in these underserved areas.

All leading universities in the region should develop a comprehensive digital strategy. This strategy should identify key digital initiatives and priorities based on their potential impact on students' learning outcomes. It is recommended to adopt a common set of recommendations for the region regarding HEI digital transformation based on global best practices¹⁸⁹ and establishing frameworks to align strategies at the institutional level. In fact, Central Asia already has experience of sharing strategies and exchanging best practices on digital transformation (see Box 2). It is also recommended to launch programs at the national level to support the overall digitalization of universities (including management, procurement, education quality assurance, financial accounting, educational and research activities). A separate emphasis should be made on establishing digital learning infrastructure, such as learning management systems (LMS). Entering partnership agreements at the regional level with suppliers could be an option to secure a broader dissemination of compatible LMSs at HEIs in Central Asia. Furthermore, regulatory frameworks should be developed to allow for shared-usage of digital infrastructure, including addressing issues related to user and equipment identification, digital security, and cloud-based data storage.

Box 2. HiEdTec: Digital technologies for modernizing higher education in Central Asia

The objective of the HiEdTec project is to support the digital transformation of partner universities from five Central Asian countries and five EU countries. The project is financed by Erasmus+, coordinated by the University of Ruse (Bulgaria) and aims to implement innovative EdTech tools and teaching methodologies in the educational process. The project seeks to expand the internationalization of national higher education systems to enhance the skills of teaching and research staff by strengthening linkages between EU universities and partner countries.

Under the project, recommendations have been developed to adapt the higher education system in each of the Central Asian countries to digital transformation. These recommendations include detailed suggestions for ministries, university management and university staff. Successful implementation of the suggested measures is expected to improve digital skills for faculty and students in all Central Asian countries, as well to increase access to education for vulnerable groups. Key project outcomes are:

- The creation of an academic network for sharing experience and best practices related to innovative educational technologies and teaching methodologies;
- Collecting best practices on digital transformation of higher education;
- Developing principles for adapting the education system to the digital world for each Central Asian country;
- The establishment of 15 Centers for the development of innovative educational technologies;
- The establishment of 45 active classrooms and virtual classrooms in each Central Asian partner university;
- Formulating guidelines on innovative educational technologies;
- Creating courses for faculty members to acquire digital skills, including on innovative teaching methods;
- Creating 75 e-learning courses.

Source: <https://hiedtec.ecs.uni-ruse.bg/ru/?cmd=gsIndex>

The transfer of to digital identification procedures would help streamline digital transformation across universities. By transferring all identification procedures and documents, such as student cards, academic records, and teaching contracts, into an electronic format, universities can centralize data on students and faculty, to strengthen evidence-based management decision and reducing paperwork. This shift will also promote the transition to green and digital technologies, while also improving the digital skills of university administrators. In the long-term, all university management information should be aggregated in a digital format and accessible to HEI administration through modern interfaces (for example, information dashboards).

Finally, there is a need for disseminating of digital instruments for assessing students' skills and competencies recognized in all countries of the region. These mechanisms will enable better evaluation of the quality of education both for faculty members and university administrators, leading to more result-oriented financing of educational programs and performance-based remuneration of faculty. Comparable evaluation of skills and competencies, linked to a digital student/graduate profile, can improve employers'

¹⁸⁹ See OECD Working Paper *Digital higher education: Emerging quality standards, practices and supports* with overview of the leading standards of digital transformation for higher education, URL: <https://www.sipotra.it/wp-content/uploads/2022/11/Digital-higher-education-Emerging-quality-standards-practices-and-supports.pdf>

understanding of young professionals' learning outcomes and mitigate skill mismatches. Moreover, learning outcomes recorded in a digital format can foster intra-regional educational as well as labor mobility, and increase trust between universities in the region by providing an additional instrument for objective assessment of education quality.

3. Strengthening university management capacity

Central Asian universities need to strengthen their management capacity to ensure effective governance and a strong orientation towards results. To achieve this, it is recommended to establish and develop a range of short-term executive education programs in partnership with leading business schools. These programs should specifically target university managers, such as rectors, vice-rectors, directors and deputy directors of institutes, or deans of faculties. By equipping these individuals with the necessary management knowledge and skills, this initiative would help develop a network of higher education managers in Central Asia that can drive positive changes and innovation in the educational policy at university and national levels.

Moreover, frameworks should be established to facilitate the dissemination of best practices in university management. One possible mechanism could be the creation of a regional observatory for university management performance. Under this observatory, universities could collect data on their management activities and obtain survey data from key stakeholders using a unified framework. The collected information could then be shared among participating institutions to conduct self-evaluations, assess efficiency, exchange best practices, introduce advanced tools for internal quality assurance, and conduct research. Such an observatory could operate under the auspices of the Association of Leading Universities of Central Asia (see Action 3.1.3.).

4. Results-oriented approach to university management and staffing

In order to ensure a strong orientation towards results, it is necessary to introduce modern instruments for university performance monitoring. An effective model for allocating public funds for higher education in Central Asia should prioritize alignment with national priorities, incorporate key performance indicators, promote transparency, and facilitate long-term planning. As such, to move towards results-based financing and outcome-based policies, HEIs must develop comprehensive institutional plans and monitoring systems. Consequently, institutional monitoring mechanisms that consider a wide range of key performance indicators (R&D volume, academic mobility, internationalization, cross-country cooperation, dual-degree programs, impact of publications, etc.) would need to be established. These indicators can also be used for establishing accreditation requirements for universities.

In addition, public authorities in the region need to improve accessibility and depth of data related to research and higher education. Transitioning to a more transparent system would need to be supported by advanced data collection and analysis systems at the national level. Such mechanisms would improve transparency and accountability in the allocation of public funds. One way to achieve this is to promote performance-based agreements between HEIs and public authorities, where the allocation of public financing is contingent upon the achievement of predetermined performance indicators. This approach incentivizes HEIs to strive for excellence and ensures that funding is directed towards institutions that consistently demonstrate positive outcomes.

Finally, at the institutional level, changes in staff contracts are needed. This would include the establishment of effective contracts, where remuneration is differentiated based on performance targets. As such, it is important to broaden the scope of remuneration criteria beyond classroom teaching load, and to take into account factors as publication activity, academic mobility, and professional self-development, which should be incentivized in faculty contracts. Furthermore, it is essential to develop a standardized and comparable career grading system for both research and teaching staff. This system should be intricately linked to transparent criteria that directly correspond to targets outlined in employment contracts. By establishing clear expectations and reward structures, institutions can foster a culture of excellence and provide motivation for faculty members to actively pursue their goals. These changes in staff contracts will not only enhance accountability and performance within the academic community but also contribute to the overall improvement of teaching quality, research productivity, and professional development.

5. Enhanced financial and managerial autonomy of universities

HEIs should be granted a significant level of autonomy in various aspects of their operations. This includes the autonomy to establish their own admission requirements, determine the number of students to enroll, set tuition fees, and establish criteria for providing financial assistance to students in need. In addition, HEIs should also have the autonomy to independently hire and remunerate their staff, develop educational programs and implement more flexible rules for assessing and evaluating learning outcomes that align with the demands of the labor market. Moreover, a greater number of universities should be allowed to award academic degrees and be granted the autonomy and flexibility to organize academic and student mobility initiatives. This will facilitate collaboration and knowledge exchange among institutions, enhancing the quality of education and research in the region. Finally, HEIs should have control over their finances and the ability to independently allocate resources within their institutions. This would enable them to strengthen weaker academic units, cross-subsidize programs, and quickly and flexibly finance new initiatives in response to changing needs and emerging opportunities.

Priority Policy Area I. Improving Access, Quality, and Relevance of Higher Education

This Priority Policy Area aims to improve the quality, access, and relevance of higher education.

Pillars 1.1. and 1.2. are interconnected and dedicated to the establishment of an effective quality assurance system in higher education and improving the quality of teaching. In a fiscally constrained environment, quality can be improved by increasing competition, faculty efficiency, and quality assurance. To enhance teaching quality, higher staff remuneration linked to performance and the provision of professional development opportunities for faculty are crucial. Moreover, quality assurance should transition from state compliance control and instead rely on independent external accreditation, through external regional level quality assurance and a comprehensive internal quality assurance system.

Pillar 1.3 on increasing access to higher education will contribute both to the accumulation of human capital to the level of the most developed countries and to a reduction in social inequality. One way to create equal educational opportunities is to consider social indicators when distributing state funding to universities. Providing income-contingent educational loans is another way to support vulnerable populations and encourage families to invest in education. Direct scholarships can be more expensive, so they should be used to support talented students from low-income families and combined with information support.

Pillar 1.4 on the relevance of higher education aims to strengthen linkages between businesses and universities through skills forecasting, reducing skill mismatches in labor market and modernizing curricula. Indeed, labor market forecasting and graduate tracking systems are crucial for policymaking and adaptation strategies. Curricula of academic programs should be updated based on comprehensive piloting and focus on prospective skill structure. Finally, outcome-based learning is important to respond to the labor market needs and to improve the quality of education.

Pillar 1.1. Ensuring effective external and internal quality assurance

Actions and projects	Priority	Targets
<i>Developing regional accreditation standards</i>	I	<ul style="list-style-type: none"> • Adoption of regional accreditation standards for Central Asia • Transition to independent external accreditation • Pool of world-class experts in higher education quality assurance
<i>Promoting effective internal quality assurance units and tools</i>	II	<ul style="list-style-type: none"> • Aligned framework requirements for internal quality assurance • Launch of university centers of institutional research and internal instruments for teaching quality assessment by students in the leading HEIs
<i>Establishing the Central Asian Accreditation Agency (a regional network of agencies).</i>	II	<ul style="list-style-type: none"> • Launch of the Central Asian Accreditation Agency
<i>Developing sectoral higher education quality standards</i>	III	<ul style="list-style-type: none"> • Sectoral accreditation standards for distance learning, for master's programs, and for sectoral disciplines • Modernization of extramural (part-time) education: engagement of employers, increasing face-to-face contact, distance/hybrid form of education
<i>Initiating an objective cross-country comparison of educational quality and learning outcomes</i>	III	<ul style="list-style-type: none"> • Participation of the countries of the region in international competence assessment • Framework for aligned grading scales of standardized final examinations of high school students

1. *Developing regional accreditation standards.*

Developing regional quality standards for the accreditation of HEIs and educational programs is essential to harmonize the principles of quality assurance in higher education and the requirements for accreditation agencies operating in Central Asia. This framework could lead to improvements in the quality of their work, increasing the level of accreditation in line with international standards, and enhancing the international

positioning of Central Asian higher education systems and universities. The following principles could be reflected in this framework:

- Alignment with national accreditation requirements and strategic planning documents related to higher education of Central Asian countries,
- Adaptation of the European standard (*The Standards and Guidelines for Quality Assurance in the European Higher Education Area, ESG*) and inclusion of regional components that would address the most critical challenges faced in the region,
- Focus on developing a self-assessment culture, cross-country exchanges of best practices related to internal quality assurance systems,
- Ensuring connectivity between external accreditation and internal quality assurance.

Key sections of the document may include standards for external quality assurance agencies, recommendations for internal quality assurance, and mechanisms for aligning national accreditation standards. The framework could be developed with support of international partners, such as ENQA experts and supported by a digital platform for aligning accreditation requirements and national qualifications frameworks.

When it comes to assessing education quality, it is necessary to gradually shift from direct state control towards independent external accreditation. This can be achieved through different measures, including grants for HEIs to undergo external accreditation to facilitate the adoption of the new system. Moreover, the automatic extension of accreditation for HEIs represented in global university rankings could be piloted. Finally, increasing public funding for HEIs based on their accreditation status can encourage universities to undergo external quality assurance as well.

Furthermore, Central Asian countries could train quality assurance experts with the support of international agencies and expand the pool of experts to include foreign specialists. By creating a pool of world-class quality assurance experts at the regional level, a higher standard can be set for external accreditation of HEIs, increasing the relevance of assessment, and reducing the costs of the accreditation process. The pool of experts can be leveraged for the development of key documents related to quality assurance at the regional level.

The harmonization of educational requirements is a politically sensitive matter, which is an obstacle for this action. It would require an initial alignment of national strategic priorities (see Pillar 3.1). The basis for this alignment could be the ESG requirements, which set a higher standard of quality to be valuable for all countries in the region.

2. *Promoting effective internal quality assurance units and tools.*

Quality assurance standards developed at the regional level (see Actions 1.1.1., 1.1.3., 1.1.4.) could incorporate as well instruments for self-assessment at the institutional level. Aligning internal quality assurance tools under a unified framework would enable effective exchange of best practices and comparative analyses of quality trends among universities in the region. The exchange of best internal assessment practices can become one of the activities facilitated by the Association of Leading Universities in Central Asia (see Action 3.1.3.). An internal quality assurance framework could include the following:

- University management support for internal quality assurance: This would entail the creation of quality assurance units in HEIs that regularly interact with various university departments and engage key stakeholders such as businesses and regional authorities in the assessment process.
- Regular monitoring of the quality of education: Surveys, focus groups and other feedback mechanisms should be employed to gather information from students and university staff on the quality of education. A model information module could be developed to launch university institutional research centers which would specialize in analyzing the quality of education.
- Integration of digital instruments for student evaluations: Higher education management information systems should incorporate digital tools that allow students to evaluate the quality of completed courses.

- Providing professional development opportunities for university staff in internal quality assurance: It is crucial to offer training and professional development programs that equip university staff with the necessary skills and knowledge to effectively conduct internal quality assurance processes.

By implementing such an internal quality assurance framework, universities can ensure a systematic approach to maintaining and enhancing the quality of higher education. It will foster a culture of continuous improvement, enable data-driven decision-making, and ultimately contribute to the overall development and excellence of higher education institutions in the region.

3. *Establishing the Central Asian Accreditation Agency (a regional network of agencies).*

A regional agency for education quality assurance is a common practice worldwide (CHEA in the United States, ENQA in Europe, AQAF in ASEAN countries). A similar initiative has been mentioned in the Turkestan Declaration. In Central Asia, a pilot program for such an agency was implemented from 2009 to 2012 (Central Asian Network of Quality Assurance, CANQA), which helped disseminate best practices in education quality assurance but did not result in the development of common standards or the formation of an organizational entity for coordination at the regional level.

The responsibilities of the Agency/network could encompass the following:

- Developing an institutional framework to support common regional standards for quality assurance, regional coordination of national quality assurance organizations and accreditation agencies,
- Providing methodological support for the development of national quality assurance systems within each Central Asian country,
- Conducting an external assessment of national agencies for quality assurance based on the approved standards,
- Aligning higher education quality standards in Central Asia with European standards, including integration with EQAR, and representing Central Asia in global higher education quality assurance networks,
- Analyzing best practices, developing, and approving education quality standards for selected fields of study (see Action 1.1.4.),
- Strengthening linkages between HEIs and industry at the regional level and facilitating the engagement of key stakeholders in higher education quality assurance,
- Providing training to quality assurance staff and supporting the creation of a regional pool of quality assurance experts.

By establishing such a regional agency, Central Asian countries can foster harmonization, collaboration, and continuous improvement in education quality assurance. It will enhance the credibility and reputation of HEIs in the region, ensuring the delivery of high-quality education and promoting regional cooperation and integration in higher education.

4. *Developing sectoral higher education quality standards.*

Central Asian countries would benefit from establishing higher education quality standards in the following key areas:

- Developing guidelines to modernize quality assurance mechanisms in master's programs to ensure their relevance and effectiveness,
- Developing guidelines to modernize quality assurance for agricultural, medical, and pedagogical educational programs, taking into account the specific requirements and latest advancements in these fields,
- Establishing standards and procedures for the accreditation of open and/or distance education programs, recognizing their growing importance in the education landscape,
- Establishing mechanisms for the recognition of learning outcomes achieved through informal education, acknowledging the valuable skills and knowledge gained outside traditional educational settings.

It is also important to update guidelines regarding quality assurance for extramural educational programs. They may include more active engagement of industry representatives in assessing learning outcomes, updating and adapting curricula for distance learning formats, more active use of distance learning technologies and digital environments, and increasing face-to-face contact between students and teachers. The development of hybrid and distance education could be the basis for modernizing extramural education (see Action 1.3.2).

5. *Initiating an objective cross-country comparison of educational quality and learning outcomes.*

More active participation of Central Asian countries in international education assessments (PISA, TIMSS, PIRLS, PIAAC, etc.) is needed, including for school education, which is important for improving the quality of higher education. This would allow evidence-based policymaking through objective cross-country comparisons of educational quality and learning outcomes. Encouraging student participation in globally recognized tests can provide a comparable assessment of their readiness for education and research programs, particularly in English and STEM disciplines. Aligning grading scales of standardized final examinations for high school students would enable the comparison of dynamics in the quality of preparation of higher education entrants across Central Asian countries. Altogether, these steps are important for the development of education systems that are focused on learning outcomes (see Action 1.4.3.). They foster continuous improvement, benchmarking against international standards, and the creation of educational environments that prepare students for future success.

Pillar 1.2. Enhancing the effectiveness and the quality of teaching

Actions and projects	Priority	Targets
<i>Increasing the attractiveness and the effectiveness of the teaching profession</i>	I	<ul style="list-style-type: none"> • Average salary of HEI's teaching staff is higher than the average salary in the region • Model remuneration scheme for teaching staff that considers publication activity and students' learning outcomes • Efficient contracts with teaching staff • Ensuring functional differentiation of faculty members • Reducing teaching load of teaching staff • Increasing the share of research institutes employees among HEI faculty members
<i>Developing an integrated labor market for academic staff</i>	II	<ul style="list-style-type: none"> • Decentralization of teaching staff recruitment procedures • Regional online portal for teaching and research vacancies
<i>Developing modern teaching skills and methods</i>	III	<ul style="list-style-type: none"> • Inter-university methodological center for teaching excellence • Continuous professional development programs on modern teaching methods and language proficiency

1. *Increasing the attractiveness and the effectiveness of the teaching profession.*

To attract and retain highly qualified faculty, it is crucial to offer competitive salaries that surpass the average income level in the country. This would not only ensure that minimum staff selectivity standards are met but also enhance staff performance. In many countries, competitive remuneration has been the key to attracting and retaining highly skilled personnel at universities. For example, in Germany, the Czech Republic and Latvia, university staff on average receive 220%, 160% and 167% of the average disposable income per capita, respectively.¹⁹⁰ In 2012, Russia set a target for the average researchers' salary to reach 200% of an average salary in a corresponding region, and it was largely accomplished by 2018.¹⁹¹

¹⁹⁰ Authors' calculations based on the data from OECD, URL: <https://data.oecd.org/hha/household-disposable-income.htm> and Altbach, Philip G., Liz Reisberg, Maria Yudkevich, Gregory Androushchak, and Iván F. Pacheco, eds. 2012. Paying the professoriate: A global comparison. Data for 2009-2010.

¹⁹¹ ISEK NRU HSE (2022). Salary and wages of researchers: dynamics before and after "May orders" <https://isek.hse.ru/news/673357031.html>

At the same time, increasing remuneration requires substantial resources, and changing contracts is can be a sensitive for employees. To mitigate this potential obstacle, on the one hand, the contracts conditions should be transparently communicated, and, on the other hand, HEIs should have the autonomy to increase the share of remuneration linked to academic staff's performance. Performance-based financial incentives should consider both teaching load and students' learning outcomes, but also out-of-class activities, and research and publishing performance. Several countries, such as South Korea,¹⁹² Estonia,¹⁹³ and the United States,¹⁹⁴ have implemented similar reforms with positive outcomes. To implement such reforms, HEIs would need greater financial autonomy, including for the use of extra-budgetary funds, and authorities should also support the development of national-level guidelines and model schemes for financial performance-based incentives for faculty based on best practices.

To reduce teaching load on university staff and increase their productivity, it is essential to modernize their time budgets. This can be achieved by implementing modern educational methods that prioritize independent learning by students and decrease reliance on traditional classroom lectures. Reducing classroom load would provide academic staff with more time to engage in scientific research and better preparation to classes.

Financial incentives for academic staff need to consider the functional differentiation of faculty members. This can be achieved by varying the teaching workload of different type of academic staff according to their functional roles. Such a distinction could differentiate between lecturers (without research activity), researchers (even distribution of time between teaching and research), tutors (training of academic and teaching staff), and professor of practice (teaching practice-oriented disciplines, career advising, and advising on project tasks). This functional division would allow to increase the productivity of staff through greater specialization, but also to enhance intra-regional mobility of academic workforce and facilitate the recruitment industry practitioners in universities, including from other countries of the region. Additionally, engaging scientific personnel from research institutes for teaching at HEIs could be supported to ensure greater cooperation between universities and research institutes. This could be implemented through short-term contracts but also different types of grant support for courses developed jointly by university staff and scientists from sectoral research institutes.

In light of this functional division, it is necessary to differentiate hiring requirements, and to align them across the region. In parallel, there should be a gradual increase in qualification requirements for academic staff that considers proficiency in foreign languages, modern teaching skills, and research skills. To assess these requirements, standardized international tests for academic staff should be more widely used in HEIs.

2. Developing an integrated labor market for academic staff.

To improve the efficiency and effectiveness of staff recruitment procedures, Central Asian countries should further decentralize such processes by reducing formal requirements and reporting, as well as granting more autonomy to universities in their human resource policies. In the medium term, an important step could be the development of regional standards that would harmonize qualification requirements for hiring faculty members, considering their functional specialization. Developing common principles for faculty's required skills would increase consistency, as well as intra-regional mobility for academic staff.

The creation of a unified online portal for academic vacancies in Central Asian HEIs could be useful for developing an integrated labor market for faculty. This portal could be operated as a sub-division of global online aggregators of academic vacancies. Such a project would promote healthy competition between university staff, expand the pool of candidates to a regional scale, as well as address any horizontal imbalances in the labor market, allowing for greater flexibility in hiring across borders.

¹⁹² Kim, D. H., & Bak, H. J. (2016). How do scientists respond to performance-based incentives? Evidence from South Korea. *International Public Management Journal*, 19(1), 31-52.

¹⁹³ Türk, K. (2016). Performance management of academic staff and its effectiveness to teaching and research—Based on the example of Estonian universities. *Trames*, 20(1), 17-36.

¹⁹⁴ Terpstra, D. E., & Honoree, A. L. (2009). Merit pay plans in higher education institutions: Characteristics and effects. *Public Personnel Management*, 38(4), 55-77.

3. *Developing modern teaching skills and methods.*

A regional inter-university methodological center for teaching excellence could be launched to share best practices for effective teaching in Central Asia. The Center could implement a common research program dedicated to pedagogical innovations, in partnership with leading global research centers specialized on these issues. One of the most important functions of the Center could be to disseminate best practices and aggregate them in a regional repository of teaching excellence, while also providing continuous professional development opportunities for academic staff in Central Asia. An example of a similar initiative is the Office for Learning and Teaching established in Australia in 2011, which provided competitive grants for researching and implementing innovative teaching methods and led to the establishment of a national repository for teaching resources and best practices, the Learning and Teaching Repository.

A cornerstone activity for such Center could be a regional professional training program on modern teaching methods and modern pedagogy designed for university staff. This program could be implemented in an online format, and an important element could be the design of new educational products (a program, a module, a course, etc.) by engaging teams composed of people coming from across Central Asia. This program could specifically focus on the acquisition of digital teaching skills and skills to teach in hybrid formats among faculty members and should be aligned with university strategies for digital transformation (see General Institutional Prerequisites, *Development of Digital Infrastructure*). In addition to promoting teaching excellence, strengthening language training is also important. This can be achieved for instance by developing training programs under the Center, or by subsidizing foreign languages courses (or taking international language proficiency tests) for junior researchers, and especially Ph.D. students. By strengthening language training, teaching and research staff will be better equipped to collaborate with their international counterparts and contribute to the global scientific community.

Pillar 1.3. Widening participation and access to higher education

Actions and projects	Priority	Targets
<i>Including social inequality in the educational policy agenda</i>	I	<ul style="list-style-type: none"> • Launching a monitoring of the social composition of student bodies • Accounting for social indicators in funding formulas, grants, targeted admission, and education loans
<i>Developing distance/virtual education</i>	II	<ul style="list-style-type: none"> • Online education platform of Central Asia
<i>Targeted assistance to groups at risk and talent support</i>	III	<ul style="list-style-type: none"> • National programs for rural areas, talented children from disadvantaged families, first-generation students

1. *Including social inequality in the educational policy agenda.*

To promote social equity in higher education, several policy measures could be implemented at the national and regional levels, including the following:

- Launching a regional monitoring system to assess the social composition of student bodies across Central Asia and identify underrepresented or disadvantaged groups,
- Incorporating social characteristics such as gender, first-generation students, and rural residence, in the allocation of public funding to HEIs,
- Providing targeted scholarships and financial support to students from disadvantaged backgrounds,
- Expanding targeted admission programs for vulnerable students and those with a disadvantaged background,

- Pilot-testing social impact bond projects to address the low enrollment of vulnerable groups in higher education.¹⁹⁵

In the medium term, income-contingent educational loans can be effective instruments to promote equity in higher education. These loans can be structured around borrowers' income, thereby increasing motivation and flexibility of support instruments. Given the high social impact of higher education and the large potential of such loans, Central Asian authorities should provide support for the educational lending market, such as government guarantees, extended loan maturities, or reduced interest rates for successful graduates.

2. *Developing distance/virtual education.*

Distance and virtual education have proved their efficiency in higher education, to levels close to full-time education.¹⁹⁶ Therefore, they have the potential to address territorial disparities in access to higher education in Central Asia. Establishing a regional online education platform can be a solution to expand the use of distance education. This platform can be a collaborative tool between leading universities of the region (for example, under the auspices of the Association of Leading Universities of Central Asia, see Action 3.1.3.) and provides certificates and recognition of completed online courses by the participating universities. The following could be the principles to govern the organization of the platform:

- Courses taught by leading experts in the areas of excellence of Central Asian universities should be available on the platform,
- Certificates should be issued based on the successful completion of checkpoints and rigorous examination proctoring,
- An independent international body should ensure the quality of courses and their evaluation procedures,
- The harmonization of framework requirements for the learning outcomes of the courses of the network's member universities is ensured,
- Courses should be available for everyone, free-of-charge, and can be incorporated into the curricula of students from any university in Central Asia,
- Certificates obtained from this platform should be recognized as educational credits for accredited university programs.

The development of online education can increase participation in higher education, reduce teaching workload for university staff, and become a driver of extramural education modernization. In the medium term, distance education could evolve into a Central Asian University of Open Education. Such universities operate in many countries and are effective instruments for increasing enrollment in higher education (see Box 3). In addition, open universities are important mechanisms for attracting foreign students (see Action 3.3.3.). An open university can provide commercial programs of continuing higher education or micro-credentials by leading universities in Central Asia.

¹⁹⁵ Social bond is a multilateral contract in which payments from the government to investors (businesses, non-profit organizations) are linked to the achievement of certain socially important targets (in education, health care, etc.).

¹⁹⁶ Chirikov, I., Semenova, T., Maloshonok, N., Bettinger, E., & Kizilcec, R. F. (2020). Online education platforms scale college STEM instruction with equivalent learning outcomes at lower cost. *Science advances*, 6(15).

Box 3. Open universities: Using distance learning for quality education

An open university is a HEI that utilizes online learning technologies and openly admits anyone who wishes to pursue education. This flexible format promotes access to education and allows for cost reduction on campus equipment and the use of interchangeable academic modules and MOOCs to increase efficiency and enable engagement of a large number of students, including foreign students. For example, the oldest open university in the United Kingdom, Open University UK, has 8,000 students from more than 150 countries. Moreover, 23 million students are taking courses on open platforms such as OpenLearn and FutureLearn. Universitat Oberta de Catalunya offers 27 bachelor's and 44 master's programs in a wide range of disciplines for 50,000 students and is listed among the 500-600 top universities worldwide according to THE ranking (2023).

Open universities can also be used in the context of regionalization of higher education. The Open University of West Africa (OUWA) and the University of the West Indies Open Campus (UWIOC) provide remarkable experiences:

- OUWA was established in response to the economic and social challenges faced by the Western Africa region. It specifically aimed to attract students not only from Ghana but from all countries of the Economic Community of West African States to enroll in MOOCs of leading universities in the region. In cooperation with the University of the People (California, United States), OUWA offers students affordable and accredited bachelor's degrees in business administration and computer sciences. OUWA students can study at classrooms equipped with computers and internet access owned by OUWA partners.

- UWIOC educates 20,000 students from 17 Caribbean countries using both distance learning and full-time education – the university has a total of 42 learning centers in the region. UWIOC's bachelor's and master's programs are accredited by the Barbados Accreditation Council, while diplomas are recognized by all participating countries.

Sources : <https://vc4a.com/open-university-of-west-africa/>, <https://www.open.uwi.edu/about>, <https://www.timeshighereducation.com/world-university-rankings/open-university-catalonia>, <https://www.open.ac.uk/courses/international-students>

3. Targeted assistance to groups at risk and talent support.

Targeted programs are an important tool to increase access to higher education for groups that are underrepresented in HEIs. Although disadvantaged groups may vary by country, certain factors are common to the region, such as people living in rural areas, women in STEM programs, students from low-income families, and first-generation students. To address these challenges, the following targeted support programs could be implemented:

- Grant support: Universities offering programs aimed at widening access to higher education for specific at-risk groups could receive financial assistance.
- Scholarships: Scholarships can be awarded to talented students from disadvantaged socio-economic backgrounds, enabling them to study at leading universities.
- Quotas: Quotas can be established for low-income families or first-generation students who are close to meeting the required threshold in university entrance examinations.

Moreover, all at-risk groups would benefit from additional information and awareness-raising initiatives that connect universities and schools and aim to reduce barriers. Research has shown that direct monetary support mechanisms in education can inadvertently stigmatize beneficiaries, making it essential to combine them with awareness-raising instruments for maximum effectiveness.¹⁹⁷

¹⁹⁷ Herbaut, E., & Geven, K. (2020). What works to reduce inequalities in higher education? A systematic review of the (quasi-) experimental literature on outreach and financial aid. *Research in Social Stratification and Mobility*, 65, 100442.

Pillar 1.4. Ensuring the relevance of higher education

Actions and projects	Priority	Targets
<i>Training Central Asia's future workforce</i>	I	<ul style="list-style-type: none"> • Forecasting regional labor market trends • Implementing graduate tracking systems at the national and regional levels • Setting priorities of public funding of HEIs in line with future labor market and demographic trends • Expanding admission to master's and STEM programs
<i>Developing and updating skills for the modern economy</i>	II	<ul style="list-style-type: none"> • Disseminating project-based education • Including green skills in curricula • Launching regional mass online courses on coding, machine learning and computer literacy
<i>Curricula modernization</i>	III	<ul style="list-style-type: none"> • Pilot redesign of programs on the most popular and priority disciplines • Granting HEIs the autonomy to design their own educational programs, for those that have completed external accreditation • Engaging business in the modernization of curricula • Transition to outcome-based education

1. Training Central Asia's future workforce.

It is essential to forecast the future skills needed in national and regional labor markets to ensure that the workforce is prepared for the evolving demands of the economy. To achieve this, the following principles are key:

- Developing a unified data collection methodology: Establish a standardized approach to collect and analyze data on general trends across Central Asian labor markets,
- Conducting quantitative forecasts: Use quantitative analysis to anticipate future employment trends within different economic sectors,
- Assessing vacancies and skill demand: Evaluate the number of job openings by country and profession, and analyze the current and future skills and competencies in demand,
- Using big data from online recruitment platforms: Aggregate and analyze data from open online recruitment platforms to facilitate short-term forecasting of labor market needs,
- Analyzing labor mobility scenarios: Study labor mobility patterns in the region and identify the most in-demand areas for interventions at the national and regional levels.

The *Cedefop skills forecast*, created by the European Centre for the Development of Vocational Training in 2010, can serve as a benchmark.¹⁹⁸ This instrument combines quantitative and qualitative data, including macroeconomic forecasts, employment trends, and data from surveys on the supply and demand for professional skills in the EU.

In parallel, Central Asian countries can develop graduate tracking systems both at the national and regional levels. This could include:

- Aligning data collection and surveys: Coordinate data collection efforts and surveys with available national studies of students and graduates and developing a unified database,
- Gradually unifying individual recordkeeping: Consolidating individual records of students and graduates for more efficient data management (see Action 3.2.3.),
- Monitoring graduate satisfaction and self-assessment: Regularly assess the level of satisfaction among university graduates with the quality of education and their self-assessment of modern skills and competencies.

Results from these monitoring systems can be used in university funding formulas to strengthen an orientation towards outputs. Moreover, open databases that record anonymized data on first salaries, employment, and duration of job search for graduates, disaggregated by HEIs, could become an important

¹⁹⁸ CEDEFOP (2022). Skills Forecast, URL: <https://www.cedefop.europa.eu/en/tools/skills-forecast>

instrument for raising awareness among both students and employers of the different quality education offered by educational programs across Central Asia. Such data can be aggregated anonymously based on information from pension funds, tax administrations, national job aggregators, and other relevant sources.

The results of forecasting and graduate tracking systems can improve the relevance of educational program to the labor market needs. It is important to prioritize public funding for strategic disciplines based on anticipated skills demand, the number of vacancies, as well as labor mobility. In particular, STEM programs, especially at the master's level, should be given priority, with a focus on increasing enrollment of women. In the long-term, the share of master's students in the region should be increased to about 20-30%, to as align with levels seen in high-income countries. This can be achieved through the expansion of master's programs along three directions:

- Practice-oriented master's programs in cooperation with industry stakeholders,
- Research-based master's programs focusing on research skills and engineering,
- Master's programs for prospective sectors of green economy.

Increasing admission to master's programs can also drive the development of postgraduate education and Ph.D. schools (see Action 2.2.3.). Furthermore, it is recommended to gradually align curricula of higher and vocational education to better respond to the demand for specific organizational, managerial, and technological skills.

In the long-term, a regional cooperation platform for universities and industry could be developed in Central Asia. This platform can enhance interactions between HEIs and companies in key sectors of the economy at regional level. This platform can also function as a crucial instrument for engaging businesses in modernizing curricula, internal and external quality assurance, expert surveys and labor market forecasting.

2. Developing and updating skills for the modern economy.

Central Asian countries need to expand opportunities for students to develop soft, green and digital skills. One effective instrument for developing soft skills is through project activities integrated into university curricula. This can be implemented through various means, such as:

- Introducing the position of project work mentor in universities, engaged in the translation of business or industry tasks into the learning tasks and incorporating project work into student curricula,
- Mandatory inclusion of project work into courses,
- Recognizing project supervision as a teaching workload for academic personnel.

It is recommended to promote project work and internships in universities, which can further be integrated into a unified digital platform. This would involve the aggregation of business and industry project tasks, internships and practices in which employees of enterprises are ready to be industrial consultants. Including practical activities specifically aimed at acquiring soft skills would help universities to ensure the alignment of their educational programs with the needs of the industry, government, and public institutions. Developing extracurricular activities and a network of student clubs is another effective tool for nurturing soft skills. While data on extracurricular activity among students is limited, experts emphasize the untapped potential in this area.

To develop green skills, universities should offer courses related to sustainable development practices, green technologies, and environmental challenges, and include components for green skill development in existing courses using thematic cases. Furthermore, a regional online program should be developed to improve the qualifications of pedagogical, postgraduate, and Ph.D. students in green skills, green economy, and green skills teaching methods. This program could be modeled after the Green Skills 4 Cities project launched in 2022 by the universities of Genoa, Barcelona, Vienna, and Strasbourg, with the support of Erasmus+. The program includes a module for improving qualifications of teaching and research staff and is designed to be universally applicable to different educational programs.

In order to enhance students' digital skills, one option is to launch MOOCs at the regional level. The priority areas should include fundamentals of coding using popular languages (Python, R, SQL), data analysis and machine learning, basic computer literacy, digital communication, and mastering learning environments.

Finally, to ensure that students and workers' skills can be updated to meet the needs of the labor market, it is important to develop flexible opportunities for continuing education at universities and improving qualifications of the workforce in strategic areas. To achieve this, HEIs should expand the provision of short programs for practical training and retraining, including piloting micro-credentials. These programs should be developed in partnership with employers and focus on narrow specializations and the accelerated development of targeted skill sets that can be immediately applied in the labor market. Micro-credentials can play an important role here, especially if they can be acquired by both students and working professionals, and count as credits for the obtention of a diploma.

3. *Curricula modernization.*

The content of academic programs in higher education in Central Asia requires significant modernization, but this process is resource-intensive and particularly sensitive to all stakeholders. Accordingly, change should be incremental. Moreover, it is important for Central Asian countries to pilot the modernization of selected higher education academic programs, especially in popular disciplines, such as pedagogy, agriculture and technology industries, but also in those related to the country's strategic priorities to establish centers of excellence (see Action 2.2.1.).

For example, pedagogical programs can be adapted to develop skills required for working in EdTech. In the agricultural sector, the focus should shift from harvesting technologies towards digital agriculture, breeding, food processing and production technologies. Based on the outcomes of the pilots, model educational programs should be developed, with an emphasis on updating curricula based on the latest international research, applying modern learning methods (such as project-based and experiment-based learning), integrating elements of critical thinking and entrepreneurship, and developing soft, digital, and green skills. These model programs should be adaptive and open for use by all universities in the region, leveraging opportunities offered by digital learning environments (see General Institutional Prerequisites, *Developing digital infrastructure*). The usage of model programs would also facilitate the mutual recognition of learning outcomes (see Action 3.2.2.).

Close partnerships with industry are needed to update educational programs and courses, and HEIs and authorities should expand the involvement of business representatives in the development of curricula. Indeed, labor market feedback mechanisms, such as surveys, and regular consultations with employers and graduates, are essential for adjusting curricula in line with the changing needs of the economy. To increase the flexibility and relevance of educational content in higher education, universities that have obtained international accreditation should have more autonomy to develop their own educational programs with limited control from public authorities.

In the long term, curricula for a wide range of programs should be reoriented towards an outcome-based education model. This includes the inclusion in educational programs of specific skills and competencies that students must acquire by the end of their education, and the use of adequate assessment instruments. This also entails using data obtained from assessment of outcomes to improve teaching and learning, and to make decisions regarding resource allocation. Launching graduate tracking systems (see Action 1.4.1.) and expanding the use of digital instruments for assessing learning outcomes (see General Institutional Prerequisites, *Developing digital infrastructure*) are critical in this regard.

Priority Policy Area II. Strengthening Research and Innovation Capacity

This Priority Policy Area aims to strengthen the research and innovation capacity of HEIs.

Pillar 2.1. aims to increase the average research productivity of academic staff by improving research quality and outcome orientation, on the one hand, developing research skills of academic staff and adequate publication infrastructure, on the other hand. As such, it is recommended to provide incentives to enhance research productivity, but also to establish new academic and scientific journals across Central Asia, while also reinforcing academic ethics.

The objective of Pillar 2.2. is to stimulate research capacity of universities despite financial constraints. In order to achieve this, it is essential to concentrate resources on strategic priorities common to all Central Asian countries, increasing resource efficiency through competition, and leveraging cooperation capacity between academic institutes and universities, including through jointly utilized research infrastructure. This would imply to establish at the regional level a network of centers of excellence to develop research capacity in regional priority areas, serving as key points for regional cooperation and talent attraction, but also for disseminating best practices in research, postgraduate education quality and technology transfer. In addition, it is necessary to ensure that the quantity and quality of scientific personnel at universities meet the tasks of technological advancement, including by attracting talent and completing the transition to the Ph.D. model to accelerate the start of scientific careers and to saturate universities and businesses with a flow of highly qualified personnel.

Pillar 2.3. is concerned with reinforcing the linkages between university and industry, and knowledge transfer. These relationships are key for ensuring the development of innovative industries, capacity-building for technological entrepreneurship and stimulating the establishment of sectors with high value-added. In the medium term, best practices of technology transfer will be connected to centers of excellence, which will foster the development of high-quality standards for research in other universities as well. A key principle behind these recommendations is to develop instruments to integrate university research capacities into the emerging national innovation ecosystems.

Pillar 2.1. Increasing research productivity of academic staff

Actions and projects	Priority	Targets
<i>Providing incentives to enhance research productivity</i>	I	<ul style="list-style-type: none"> • Introducing metrics for the assessment of effectiveness of publication activity • Provision of financial incentives for publication activity • Establishing a hub of data and methods
<i>Strengthening publication infrastructure</i>	II	<ul style="list-style-type: none"> • New Central Asian academic journals in regional areas of research specialization • Promoting Central Asian journals in international research and citation databases • Ensuring access to leading international citation databases and research libraries • Launching a regional center for academic writing
<i>Promoting academic ethics</i>	III	<ul style="list-style-type: none"> • Centralized access to digital anti-plagiarism service • Whitelists of journals • Regional charter of academic ethics

1. *Providing incentives to enhance research productivity.*

To enhance research productivity, a comprehensive approach would need to be considered. On the one hand, it is important to strengthen requirements for research quality and results orientation. This could include:

- The incorporation of publication citation indicators into university performance monitoring,
- The inclusion of metrics for publication activity performance that relate to career growth in academic positions. At the same time, striking a careful balance between a “publish or perish”

strategy and complete absence of publication requirements is crucial. This could also be linked to a reduction of the classroom teaching workload (see Action 1.2.1.).

- The introduction of financial incentives for publication activity, such as bonuses as a percentage of the remuneration and super-incentives for publications in reputable global journals.

On the other hand, developing relevant research skills among scientific personnel is equally important. One option is the creation of a program for skill improvement which would include:

- The creation or adaptation of courses and training programs for researchers to improve their understanding of research activity, research culture, ethical norms, and research outcomes, as well as of the use of data analysis programs. Such courses should be published through online platforms (see Action 1.3.2.).
- The establishment of a common data repository on key research areas, as well as a continuous professional development program on modern research skills and data analysis, which would be open to all researchers in the region.
- Launching projects to support outstanding researchers who can function as coaches for other researchers in the region and develop their short-term training programs using a “train the trainers” format, for instance to improve data analysis skills (SPSS, STATA, R, EVIEWS, AMOS, NVIVO etc.). One option might be an academic mobility or fellowship program for those willing to learn advanced research skills abroad and develop a course for faculty in Central Asian universities based on their expertise.

2. *Strengthening publication infrastructure.*

Enhancing cooperation in launching new and promoting existing scientific journals at the regional level can help expand the pool of peer reviewers, increase the selectivity of accepted publications, and improve Central Asia’s global position in research. As such, authorities and HEIs can launch peer-reviewed international journals in key research areas. These journals can be hosted by centers of excellence (see the see Action 2.2.1.) or established through joint university-research institute collaborations (see Action 2.2.2.). In addition, concerted efforts are needed to promote Central Asian journals in international citation databases. This could be achieved through the provision of additional funding for quality reviews, the implementation of modern information systems for managing the publication process or launching regional special issues.

Connecting Central Asian HEIs to citation databases and international online libraries would also increase the quality of academic work in the region. To reduce costs and ensure broader availability of resources, it could also be possible to negotiate access to these databases and libraries at the regional level as well.

Finally, another option for Central Asian countries could be to establish a regional center for academic writing and publication. Such a center could provide distance digital services for all universities of the region, including proofreading and technical editing of publications, translation, preliminary peer review, guidance on publication strategy, academic English and academic visibility training. Additionally, the center could facilitate interaction with international publishing houses and citation databases, offer advisory and technical support for publishing in popular scientific media and facilitate inter-university joint applications for foreign research grants.

3. *Promoting academic ethics.*

The promotion of academic ethics could be supported by a regionally centralized approach to provide access to the best digital solutions for plagiarism detection. This would be important to reduce costs and ensure widespread use here as well. Additionally, instruments of external quality assessment of journals are needed. Thus, it could be considered to develop regional “whitelists” of recommended journals for publication, such as the ABS List of Association of Business Schools in the United Kingdom or the Dean’s List in Australia, as well as blacklists of predatory journals. In addition, publications in high-quality, white-listed journals can be encouraged by emphasizing this criterion for competitive funding from national research foundations.

To promote best practices, Central Asian countries could sign a regional charter of academic ethics, which individual universities may join. The development and dissemination of a model code of academic ethics

at the regional level can facilitate the enactment of documents regulating ethical issues in universities in the region. They could also develop at the national or regional level guidelines on academic integrity, including regarding the establishment of ethic committees.

Pillar 2.2. Building research capacity and excellence in higher education institutions

Actions and projects	Priority	Targets
<i>Establishing a network of centers of excellence</i>	I	<ul style="list-style-type: none"> Establishing a regional network of centers of excellence across Central Asian countries to collaborate on critical developmental challenges and priority sectors for the region
<i>Regional infrastructure for supporting cooperation between universities and research institutes</i>	I	<ul style="list-style-type: none"> Launching a Central Asian research support fund Establishing uniform and transparent rules for competing for research funding Coordinated research programs, joint dissertation councils and academic journals, joint research and infrastructure between universities and research institutes Regional centers for shared-usage of research infrastructure
<i>Modernizing scientific personnel training</i>	II	<ul style="list-style-type: none"> Full implementation of a Ph.D. model Possibility to defend a thesis based on the publication of scientific articles Increasing scholarships for Ph.D. students Incentivizing professors, which do not have an academic degree, to obtain a Ph.D.
<i>Forming a pool of world-class researchers</i>	III	<ul style="list-style-type: none"> Regionwide competition for attracting postdoctoral fellows A program for brain repatriation

1. Establishing a network of centers of excellence.

Central Asia would benefit from a regional program to establish centers of excellence through the cooperation of outstanding research teams at universities in the region.¹⁹⁹ Indeed, centers of excellence are usually hosted in a HEI and have the potential to connect researchers across fields and countries, including support for multidisciplinary research projects. They can help establish a critical mass in terms of scientific excellence in priority sectors, while also developing strategic capacity for developing new research opportunities. At the same time, centers of excellence can also play a key role in promoting and facilitating strategic and applied research and expertise, with the aim of fostering innovation. Indeed, they often include the participation of industry representatives in their boards to ensure close alignment between research and industry needs. Thus, they are expected to key stronger connections with the industry and to support the creation of new research-intensive firms and SMEs, including through incubator space and improved technology transfer capacity. Centers of excellence are also well-placed to attract investments – both public and private, including foreign direct investments.

A key role of centers of excellence is also to improve scientific training. Accordingly, they can play a key role in Ph.D. education in emerging disciplines and in priority sectors, for both industry and university placements. Centers of excellence also provide research training through research commercialization opportunities but can also support general research professionalization for faculty members, such as journal publishing and peer reviewing. Thus, they not only improve education in specialized fields, but also have impacts at bachelor's and master's level and help strengthen scientific leadership in HEIs. Importantly, they also participate in modernizing the research and scientific infrastructure of the host institution, helping to improve the quality of training. Finally, centers of excellence provide an opportunity to establish connections with international research networks. This involves establishing collaboration with leading institutions abroad and an environment conducive to enhancing international recognition in specific disciplines.

¹⁹⁹ Hellstroem, T. (2018). Centers of Excellence as a Tool for Capacity Building: from Strategy to Impact. OECD, Programme on Innovation, Higher Education and Research for Development.

Altogether, centers of excellence contribute to develop research and innovation capacity in collaboration with the industry, while also attracting international talents and stimulate international research cooperation. A centers of excellence program for Central Asia can be built on the best practices from the implementation of the World Bank project ACE II for instance (see Box 4).

Box 4. A regional network of centers of excellence: joint response to development challenges²⁰⁰

Centers of excellence at a key tool to improve research capacity, for both basic and advanced research. Accordingly, regional networks of centers of excellence can improve international cooperation between universities and support their research capacity. Successful examples include:

ACE II: The Africa Higher Education Centers of Excellence (ACE) Project, implemented by the World Bank, is an alliance of centers of excellence aimed at supporting the region's development. The project focuses on increasing scientific and technological capacity, improving the quality of education, attracting young talents, fostering cooperation with businesses, as well as developing solutions in the key priority sectors.

In total, 24 centers from Eastern and Southern Africa have participated in ACE II, with a focus on providing quality postgraduate education and developing joint research capacity in five regional priority areas: industry, agriculture, healthcare, education and applied statistics. Each center of excellence received up to US\$6 million to achieve their combined KPIs over five years, which including educating more than 2,800 master's students and 700 postgraduate students (including at least 1,000 women) in programs related the project's priority areas, publishing 1,500 research articles, launching more than 300 joint projects and research collaborations with the private sector and other academic institutions, and attracting additional investments of at least US\$30 million.

The initiative could involve the following:

- Orienting centers of excellence towards training highly skilled scientific personnel and conducting research to address critical regional issues and priorities for economic development.
- Providing grants for the implementation of joint research programs to networks of individual research centers within a relatively narrow research topic.
- Establishing an advanced research school (graduate school) within each center of excellence to develop master's programs in partnership with key employers and industries, as well as high quality Ph.D. programs on regional priority research areas.
- Requiring the participation of an industrial partner in each center of excellence.
- Promoting the utilization of shared scientific infrastructure among centers of excellence (Action 2.2.1).
- Ensuring the long-term sustainability of the initiative by requiring centers of excellence to attract external funding businesses and scientific funds.

Considering the challenges faced by Central Asia, research priorities for this initiative could include:

- Energy and water supply,
- Digital agriculture and biotechnologies,
- Green economy and environmental technologies,
- Mathematical physics,
- Geology and seismology,
- Healthcare and pandemic prevention,
- Regional studies in Central Asia.

The Annex provides the vision of experts with regard to leadership areas and potential partners for the establishment of centers of excellence (see Table E.1).

²⁰⁰ Sources: ACE II. A Regional Solution to Transform Science and Technology Education in Africa <https://documents1.worldbank.org/curated/en/105551478248187571/pdf/109745-BRI-ACEII-finalOct-PUBLIC.pdf>
European Universities Initiative <https://education.ec.europa.eu/education-levels/higher-education/european-universities-initiative>

2. Regional infrastructure for supporting cooperation between universities and research institutes.

To develop a more competitive research environment in Central Asia, competition and transparent rules for accessing available resources, as well as clear result-oriented criteria should be disseminated across funding sources. Moreover, shifting from the sectoral division of science funding is key to establish a level playing field between HEIs and sectoral research institutes of national academies of science when competing for funding.

To establish a close link between HEIs and research institutes, possible solutions may include the following:

- Aligning programs of fundamental scientific research at the regional level,
- Establishing joint dissertation councils,
- Establishing joint academic journals,
- Establishing joint scientific research departments for promising research areas,
- Allowing joint HEI and research institutes teams to participate together in competitions of national research funds.
- Encouraging joint teams of universities and research institutes to apply for funding of national science funds.

To implement these tasks, Central Asian countries could launch a regional instrument for financing inter-university research in the region: the Central Asian Research Support Fund. The fund could follow the procedures and principles of operation of the European Research Council (ERC) as a benchmark. Under this fund, all universities and research institutes of the region, including foreign researchers and representatives of academic diaspora abroad, would benefit from equal opportunities to apply for grants. Grants provided by this fund could be dedicated to research in priority sectors for Central Asia or supporting the development of marketable technologies and prototypes. Resource allocation criteria under this fund may include that research projects are led by multidisciplinary research teams between different universities of the region, the development of specific academic and applied products, orientation towards key social and economic challenges of the region, and involvement of junior researchers. In addition, the fund could become a key instrument for aligning research priorities of national funding competitions for science and innovations.

In the long-term, the Central Asian Research Support Fund could focus on developing joint research infrastructure between universities. This could include:

- Aligning plans for the modernization of research infrastructure at the regional level to foster cooperation,
- Provision of unique joint research installations and equipment for selected research priorities,
- Legislative regulation regarding procurement, amortization, and insurance of joint research equipment,
- Development of protocols for shared access to research infrastructure, including access to equipment for business and startups,
- Procurement of laboratory equipment that has remote use interfaces.

It is recommended to provide at the regional level competitive support for the centers of collective use of advanced infrastructure, with a quota of time of access to equipment according to the contribution of the participating country. Finally, legislative regulations would need to be introduced to create public-private partnership opportunities and enable business investments in developing shared-use infrastructure. An example of such projects is the German Clusters of Excellence Initiative, established in 2006, which promotes cooperation between universities and leading research institutes in R&D and also provides for shared-usage of research infrastructure.

Universities and academic institutions have different academic cultures and administrative accountability, which is an obstacle to the implementation of this activity. Therefore, implementation of the proposed recommendations will require coordination not only at the regional level, but also within countries among different authorities, including ministries and academies of science.

3. *Modernizing scientific personnel training.*

The development of Ph.D. programs in the region can be focused on two fundamental tasks. First, the gradual increase in the number of Ph.D. candidates to the rates of the leading countries, to ultimately reach 2% Ph.D. coverage for the 25-64-year-old group (which is similar to the United States or Germany for example). Second, the staffing of the most highly qualified personnel, not only in research centers, but also in the corporate sector.

This would require a gradual transition from the post-Soviet centralized system for awarding academic degrees towards the full-fledge implementation of the Ph.D. model. This would entail as well:

- Institutionalize the defense of Ph.D. theses based on academic publications in leading peer-reviewed journals,
- Introduce a norm of participation of international scholars in the evaluation committee and/or as an external advisor to the Ph.D. thesis,
- Expanding the rights to award academic degrees to universities that have international accreditation or demonstrate target level of publication activity and high quality in certain disciplines,
- Modernize dissertation councils to facilitate participation in the evaluation panel of scientists who are highly specialized in the corresponding fields of knowledge.

To make Ph.D. programs more attractive, it is key to increase the amount of Ph.D. scholarships to a level comparable with the average income of junior researchers. One way to achieve this is to promote the employment of Ph.D. candidates in research centers during the preparation of their theses, while part of their salary is financed through a state scholarship. In this scenario, researchers in research centers could have the opportunity to participate in the selection of Ph.D. students that will eventually join their project. Moreover, research teams that include junior researchers and Ph.D. students should be eligible for additional funding.

In addition, expanding enrollment in research master's programs could help increase the recruitment of junior researchers and enhance research skills of a younger generation of prospective researchers. For this, it is necessary to recognize standardized evaluation mechanisms (for example, GMAT, etc.) for university admission to master's programs. Finally, an important measure for Central Asian countries could be to incentivize teaching and research staff that do not have an academic degree to obtain a Ph.D.. This would create additional incentives for academic staff to develop professionally and facilitate the integration of relevant research results into the teaching process, ultimately increasing the overall quality of higher education.

4. *Forming a pool of world-class researchers.*

Two approaches could be considered for attracting highly qualified scientific personnel in academia. The first one concerns regional fellowship competition for talented postdoctoral fellows. The competition would have high entry requirements and could include the following:

- Mandatory fellowship at two centers of excellence centers in Central Asia, as well as a potential of secondment with an industry partner, between one to two years (see Action 2.2.1),
- Promote the participation of postdoctoral fellows both from Central Asia and beyond,
- A globally competitive salary complemented with a grant to conduct research.

The competition is expected to attract young talents from foreign countries and limit brain drain, by establishing connections between leading universities within the region and develop a competitive research workforce.

The second approach is a program for brain repatriation to enhance linkages with the Central Asian research diaspora, by creating a pool of Central Asian researchers living abroad ready to contribute to the development of research and development in the region. Potential instruments include inviting diaspora researchers to editorial councils of journals, as well as inviting them to participate as consultants in research projects supported by national funds, organizing academic visits, as well as co-managing postgraduate students. It is necessary to create super incentives (including non-monetary) for the most talented junior researchers working abroad that are ready to lead research teams in Central Asia. This could be done also through integrating them into centers of excellence (see Action 2.2.1.). The possibility of remote

employment and part-time employment would also need to be available for the larger pool of potential researchers-leaders. Moreover, it is necessary to implement special migration regimes targeted at highly qualified researchers including through the simplification of procedures for diploma nostrification, and minimal visa requirements. A benchmark can be a “The 1000 Talents Program”²⁰¹ which has been sponsored by China since 2008 and aims to attract highly qualified specialists from abroad to work in the country. The Program includes a number of tracks that target high-class scientists and researchers, both international and Chinese, who have studied at leading graduate schools abroad.

Pillar 2.3. Strengthening linkages between universities and industry

Actions and projects	Priority	Targets
<i>Expanding technology transfer capacity</i>	I	<ul style="list-style-type: none"> • Grants for small-scale prototyping and matching grants for university startup teams • Integrating universities in emerging national innovation ecosystems • Launching national offices/departments for transfer of university technologies • Training a pool of technology transfer specialists • Benefits for enterprises participating in public-private partnerships for developing innovative infrastructure in HEIs
<i>Developing new cooperation formats and incentives for industry and universities</i>	II	<ul style="list-style-type: none"> • Scientific expert panels in the largest state-owned enterprises • Industry-oriented dissertations • Work-integrated learning modules • Opportunities for transition to teaching positions from the industry
<i>Systematizing scientific and technical information and aggregating business requests for research and development</i>	II	<ul style="list-style-type: none"> • Harmonization of data on innovation • Regional database of scientific and technical information • Central Asian Innovation Scoreboard • Long-term scientific and technological forecast for Central Asia

1. *Expanding technology transfer capacity.*

To promote research commercialization, it is key to significantly increase support at the national level to technology transfer capacity. A key focus should be on the early stages of research commercialization, which usually lack private sector funding. The following grant mechanisms could be implemented:

- Grants for small-scale prototyping of promising developments developed in universities,
- Subsidies for small grant competitions sponsored by enterprises. This could take the form of co-financing arrangements where the state and an enterprise provide equal shares of grants,
- Matching grants for university startup teams, with a limited duration (up to one year), that are aimed at developing small businesses and supporting the entry of innovative products on the market. These grants would however be contingent to external co-financing (10-20%).

These different grants should be backed up by a mentorship program, including individual coaching and mentoring, connecting potential startup teams with promising businesses/investors. These grants should also provide the opportunity to develop inter-university and cross-country startup teams.

In addition, efforts are needed to embed university science into national innovation and technology transfer ecosystems in Central Asia. One potential solution is to establish joint prototyping centers by leading HEIs and national technoparks. Moreover, this should be coupled with the establishment of national technology transfer offices or dedicated departments within existing structures that are aimed at promoting R&D by universities (for example, within the National Office for Innovation Implementation and Technology Transfer in Uzbekistan, or the Technology Transfer Network in Kazakhstan). These offices can provide

²⁰¹ Jia, H. (2018). What Is China's Thousand Talents Plan?. *Nature*, 553(7688), S8-S8.

advisory support services to marketize research outcomes, including acceleration programs, partner searches, business planning, fundraising, marketing support, and assistance in organizing spinoff development and startups. Moreover, national offices could provide methodological support to technology transfer centers at universities and play a key role as a technological broker for university developments at the national level.

In the next phase, national offices can be integrated into a regional network that provides training on cross-cutting competencies for potential startup teams, such as product concept development, team building, investment communications, and presentation skills, etc. The network can also establish a common pool of mentors and coaches for university startups and perform preliminary expert reviews of projects with the involvement of leading international experts. It could also be possible to establish an international patent center and/or a digital service center for Central Asia within this regional office network. These centers would facilitate the formalization of intellectual property rights, manage revenues from R&D and royalties, and promote university developments at the regional level and beyond.

To implement such an initiative, it would be necessary to train a pool of specialists in technology transfer. One way to achieve this is to launch specialized master's programs in the following areas:

- Technology transfer,
- Technological brokerage,
- Research and innovation management,
- Intellectual property rights management.

However, the acquisition and use of innovation infrastructure at universities is expensive, which is why it is essential to secure investment from businesses. To encourage this, special tax regimes and benefits should be offered to enterprises that participate in public-private partnerships to establish innovation infrastructure at universities and research institutes.

Uncertainty surrounding property rights for research and innovation activities can reduce incentives for researchers to pursue the commercialization of research and increase risks for investors. While experts in focus groups did not identify significant regulatory limitations for formalizing property rights for research and innovation activities, the level of activity in this area remains low. Accordingly, it is recommended to review the relevant legislative frameworks at the national level, not only to remove barriers, but also to provide maximum incentives for developing spinoff companies and applying for patents. Increasing bonus payments for winning research grants and contract-based developments can help reduce the prevalence of shadow contracts with university staff. Moreover, favorable regulation should be also supported by awareness campaigns regarding the opportunities for registering intellectual property rights and disseminating examples of successful university technological entrepreneurs.

Nevertheless, the key obstacle to technology transfer in Central Asia is the limited demand from businesses for university R&D. State-owned enterprises dominate in key commodity markets and can afford to buy technology from global companies and not local universities. The sector of small and medium private companies is still limited and is not sufficiently innovative and science-driven to stimulate high demand for university research. Hence, successful implementation of this action requires changes in the innovation climate, including beyond the higher education system.

2. Developing new cooperation formats and incentives for industry and universities.

The establishment of scientific expert panels composed of university representatives and scientific personnel from large state-owned enterprises would be key to enhance collaboration between industry and universities. These panels can participate in discussions and expert review of investment plans related to research and development funding.

An inexpensive and effective way to increase the relevance of university research for business is to reformat Ph.D. research in the following areas:

- Introducing industry-oriented dissertations with the involvement of industry consultants in the supervision of Ph.D. theses,
- Introducing university-wide modules/courses to orient graduate and undergraduate research towards industry and business needs. The goal of such courses is to stimulate industry interest in

student's research, conduct market research, and develop strategies for applying their results to solve the real business problems,

- Piloting modules of work-based learning that foster institutional partnerships between universities and industry. These modules would provide opportunities for students to gain practical experience through internships at enterprises while receiving theoretical instruction from university faculty.

Meanwhile, it is necessary to provide opportunities for transition to academic and teaching positions from business through adaptation courses-intensives, opportunities for functional specialization for different university employees, and flexible formats for engaging practitioners in university research.

3. Systematizing scientific and technical information and aggregating business requests for research and development.

To better integrate research and development efforts between universities and businesses, it is important to systematize the scientific and technical information available and to create a centralized regional database. One potential solution is to standardize the collection and storage formats of innovation data, both at the national statistics level and within universities, following internationally recognized standards such as The Frascati and Oslo Manuals.

At the subsequent stages, this regional database of scientific and technical information could include as well reporting documentation on research and innovation projects, patents, theses, and publications. This information portal could include a register of in-demand developments from industry, as well as a repository of the most promising research outcomes made at universities and research institutes. Moreover, the portal could provide aggregated information on research and development funding opportunities for research teams in HEIs and sectoral research institutes, both at the national and international levels.

To monitor research and innovation activity at the regional level, new instruments would need to be launched:

- *Central Asian Innovation Scoreboard*: This initiative would help to identify indicators and assessment metrics for innovative development, collect and update of bibliometric, patent data, as well as other information on intellectual property, innovations and technologies from universities, businesses and research institutes. The European Innovation Scoreboard, developed by the European Commission to assess and compare innovative activities of EU Member States and other European countries, could be used as a benchmark in this regard.²⁰² This instrument measures a number of indicators related to innovation, including investments in research and development, the number of submitted applications for patents and trademarks, as well as the use of digital technologies.
- Regular business surveys: Conducting regular surveys of businesses with a panel of representatives from leading industries in the region, can help identify obstacles in their interactions with HEIs and assess the demand for university R&D. The collected information should be aggregated at the regional level.
- Long-term scientific and technological forecast for Central Asia: This forecast should be prepared based on national priorities and key sectors, including ICT, energy efficiency, agricultural technologies and biotechnologies, new green technologies, healthcare, and medicine. The objective of the forecast is to identify the most promising areas of science and technology application for the countries of the region, elaborate technological development scenarios for priority sectors, and provide recommendations to achieve synergy from investments in R&D at the regional level.

²⁰² European Commission (2022). European innovation scoreboard,
URL: https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en

Priority Policy Area III. Advancing Instruments for an Integrated Regional Higher Education Area

This Priority Policy Area aims to support the development of a more integrated regional higher education area.

Analyzing successful regionalization projects in higher education (ASEAN, EHEA, ENLACES, etc.) reveals several factors that can be applicable for Central Asia as well. First, inter-university cooperation is key for the sustainability of regionalization projects. However, initial investments in cooperation instruments and achieving political support at intergovernmental level are essential for launching this process. Second, regionalization will not be effective without developing an integrated educational space, including the harmonization of educational systems and facilitation of educational and labor mobility. Third, the effectiveness of regional cooperation is dependent on the establishment of a comprehensive cooperation framework, which usually includes the following:

- Aligned education quality assurance frameworks,
- Systems for mutual recognition of educational credits,
- Aligned qualifications frameworks and education classifications,
- Programs for facilitating educational, academic, and labor mobility,
- Coordination of research priorities, developing a large set of research programs and cross-country centers of excellence,
- Combined efforts to promote the region in global talent markets,
- Establishing associations of universities and institutions to facilitate regionalization processes.

These principles are embedded in Turkestan Declaration. This priority area is also consistent with these principles, aiming to develop the capacity for cooperation among university teams, research institutes and a wider range of stakeholders in the modernization of higher education in Central Asia.

Pillar 3.1. is central to other strategic pillars of the Roadmap, as it focuses on synchronizing strategic priorities, developing institutions and communication platforms to facilitate regional cooperation between the countries and universities in Central Asia. Establishing a regional cooperation framework precedes the implementation of virtually all other recommendations and enables a cost-efficient resolution of common problems. This Pillar emphasizes the importance of political and organizational bodies to support regionalization, as well as communities of leading universities.

Pillar 3.2. highlights the needs to harmonize the higher education space, starting with aligning framework principles for the recognition of learning outcomes and its implementation at university level, including digital infrastructure for the identification of students and their achievements.

Finally, Pillar 3.3. is dedicated to enhancing intraregional academic and student mobility. This Pillar recognizes that mobility is the most effective room for initiating strategic partnerships between the universities and academic institutes of Central Asia. In the long term, an integrated higher education space will be beneficial in developing a more integrated labor market and increasing labor mobility.

Pillar 3.1. Establishing regional cooperation infrastructure

Actions and projects	Priority	Targets
<i>Aligning strategic priorities for higher education development across Central Asian countries</i>	I	<ul style="list-style-type: none"> Aligned strategy for higher education development in Central Asia
<i>Securing political and institutional support for regional cooperation</i>	I	<ul style="list-style-type: none"> Central Asian Higher Education Council Central Asian Regional Center for Higher Education and Skills
<i>Promoting and supporting the creation of the Association of Leading Universities of Central Asia</i>	II	<ul style="list-style-type: none"> Association of Leading Universities of Central Asia
<i>Promoting the establishment of university alliances</i>	II	<ul style="list-style-type: none"> Establishing incentives and projects for supporting the creation of university alliances of Central Asia
<i>Developing a plan of regular meetings and events.</i>	II	<ul style="list-style-type: none"> Developing a plan of meetings and events: summit, symposium on quality in education, conference of partners, international higher education forum

1. *Aligning strategic priorities for higher education development across Central Asian countries.*

The countries of Central Asia need to develop the necessary infrastructure for regional cooperation, translating the principles of the Turkestan Process into practical actions. Critically, countries would need to draft a joint strategy for higher education development in the region. One potential approach could be to align national higher education strategies in the form of a roadmap for the development of higher education space in Central Asia.

2. *Securing political and institutional support for regional cooperation.*

Previous large-scale regionalization projects in higher education demonstrate the importance, on the one hand of political consensus on key areas, and, on the other hand, institutional mechanisms to facilitate coordination at different levels of decision-making. While organizational forms can vary, such bodies should enable continuous communication between key stakeholders and have the necessary authority to align priorities and specific actions at the regional level.

One possible coordination format at high political level could be the Central Asian Higher Education Council. The key objective of the Council would be to agree on common objectives, develop a platform for ministerial-level discussions, and facilitate intergovernmental interactions in higher education policy. Working groups within the Council could be established to tackle specific policy challenges in priority areas (teaching and learning, research, technology transfer, harmonization etc.) and consist of the leadership and experts of relevant public agencies.

On the organizational side, to effectively coordinate and provide technical support for the development of the Central Asian Higher Education Area, it could be considered to create a separate institution – the Central Asian Regional Center for Higher Education and Skills. The Center could be responsible for the following actions.

First, coordination functions, including:

- Monitoring the implementation of the common strategy for higher education development in Central Asia,
- Facilitating cooperation between universities and establishing institutional agreements,
- Supporting the establishment of networks and associations of stakeholders (such as businesses, universities, or NGOs) to support strategy implementation,
- Acting as a technical and financial operator of cross-country projects in Central Asia in the implementation of the agreed strategy.

Second, advisory, information and analytical functions, including:

- Providing advisory and methodological support in implementing educational policies,

- Serving as a regional center for collecting information on higher education planning and management,
- Monitoring and collecting the best international practices in higher education and research, and providing recommendations for their adaptation in Central Asian universities,
- Preparing (or coordinating the preparation) a forecast for the future skills demanded in the Central Asian labor markets (see Action 1.4.1.),
- Launching graduate tracking systems, both at the national and regional levels (see Action 1.4.1.),
- Preparing public analytical materials on the challenges and prospects of higher education and science in Central Asia.

One of the successful practices in organizing such centers is SEAMEO RIHED (see Box 5).

Box 5. Southeast Asian Ministers of Education Organization Regional Centre (SEAMEO RIHED)

SEAMEO is a regional intergovernmental organization established in 1965 by 11 Southeast Asian countries in order to promote regional cooperation in education, science and culture. The SEAMEO Regional Center (RIHED) is an institutional structure of SEAMEO that specializes in higher education and development. The center's primary objective is to facilitate cooperation among governments and universities to promote the development of higher education, mobility, and lifelong learning with a view to achieve sustainable development in Southeast Asia.

Today, the key initiatives of SEAMEO RIHED include the following projects:

- Asian International Mobility for Students (AIMS) is a student mobility program uniting nine countries of the region and involving 80 universities. This program provides for semester mobility of bachelor's students across 10 educational programs. More than 5,000 students have participated in AIMS program since 2010.
- The Greater Mekong Subregion University Consortium Development Project is supported by ASEAN and the Japan-ASEAN Integration Fund. The project has become a common platform for 22 universities-members of GMS-UC from Cambodia, Laos, Myanmar, Thailand, and Vietnam to participate in events and workshops on leadership, teaching and research management, as well as on internationalization and regionalization of higher education.
- The Regional Scientific Symposium provides a forum to facilitate discussions of new research in sustainable development and higher education. It aims to strengthen partnerships between research communities and to provide opportunities for researchers of the region and the development of interdisciplinary cooperation.

Source : <https://seamolec.org/seameo>, <https://rihed.seameo.org/>

3. Promoting and supporting the creation of the Association of Leading Universities of Central Asia.

Associations of universities are a key instrument for promoting cooperation at the regional level and facilitating the implementation of grassroot initiatives. For example, the network of universities in Southeast Asia (ASEAN University Network) can be used as a benchmark for Central Asia. The Turkestan Declaration also calls for the establishment of an alliance of Central Asian universities to enhance integration in higher education.

Central Asian countries should encourage universities in the region to establish such an association to enhance the integration process in higher education, drive horizontal communication and the development of cross-country collaboration of research teams. The key objectives of the Association would include facilitating joint educational and research programs, adopting simplified procedures for recognizing educational credits, gradually aligning curricula in similar disciplines, intensifying mobility, and launching joint and network education programs, including online programs between member universities.

The association should maximize synergy with the political and organizational support institutions listed above (see Action 3.1.2.) as support for reforms by leading universities is key to their successful realization. The Association can function as a key platform for discussing possible solutions to implement higher education strategy for Central Asia. Leading universities within the Association can also function as platforms for piloting innovative practices before scaling them up. Finally, an important objective of the Association should be the dissemination of best practices across a wide range of HEIs through mentoring programs facilitated by leading universities.

4. Promoting the establishment of university alliances.

A program for providing grant support to cross-border university consortia would promote deep structural and strategic cooperation in higher education between Central Asian countries. The objective of this initiative would be to develop a network of educational programs in areas where countries have a comparative advantage, establish solid relationships and cooperation between HEIs, and strengthen students and faculty mobility for education, internships and research. Moreover, university alliances play an important role in setting up regional cooperation infrastructure by institutionalizing collaboration between HEIs and ensuring regular dialogue at the institutional level. As such, through university alliances, integration is driven bottom-up, which ensures ownership from key stakeholders, while also promoting exchange of best practices, as well as improving the quality of education and research. The principles of this project could be built on the European Universities Initiative, which aims to support consortia of universities in Europe (see Box 6).

Box 6. University associations to strengthen higher education development, research and academic outcomes

European Universities Initiative: This initiative is an integral part of the Erasmus+ 2021-2027 program and brings together 32 countries, 44 university alliances, more than 340 universities and 1,300 program partners. On average, each alliance receives up to EUR 14.4 million of investments for four years of program implementation. Apart from preparing students and junior researchers for labor market integration, these university alliances are drivers of the development of cities and regions and facilitate civic engagement of young people. The objective of the European Universities Initiative is to organize a distributed university campus, including the following:

- Ensuring inclusion and barrier-free mobility (physical, virtual, blended) for students, teaching staff and researchers;
- Elaborating flexible educational trajectories;
- Organizing multidisciplinary international research teams focused on addressing key challenges in Europe, such as climate protection, digitalization, healthcare, democracy, migration, data protection and security.
- Engaging students in research, engaging stakeholders from non-university sectors into the development of science.

The program's KPI by 2024 is the operation of 69 university alliances that include at least 500 universities.

Using the European Universities Initiative as a benchmark, alliances of universities in Central Asia would need to include several countries in the region, with potential participation of universities from beyond, and provide flexible association formats. Participation in these alliances would primarily involve launching joint educational programs with links to research within the selected areas of excellence. In addition, such consortia aim to actively engage students in a common research program, enabling them to choose different courses offered by HEIs participating in a consortium and benefit from a more flexible curriculum. Moreover, research within these consortia would be conducted by multidisciplinary and international teams of researchers, with the participation of industry partners to train highly skilled professionals. Finally, these consortia would enable the shared-usage of research equipment or software, combine efforts on data collection and processing, and establish centralized services for supporting teaching and research activities.

The Annex provides the vision of experts with regard to leadership areas and potential partners for university consortia (see Table E.1).

5. Developing a plan of regular meetings and events.

Developing a regular schedule of meetings and events is essential to promote collaboration and maintain a strong orientation towards outcomes. To facilitate this, a medium-term plan should be established, which could include the following key events:

- A summit of deputy heads of the government responsible for the higher education sector, convening every three years, to discuss policy and strategy.
- A ministerial summit, occurring every 1-2 years, to review progress, align efforts, and ensure coordination among the participating countries.
- An annual regional symposium on higher education quality assurance, providing a platform to share best practices and foster cooperation among the participating countries and universities.
- An annual conference of industrial, technical, and financial partners to explore opportunities for collaboration and investment in the higher education sector.
- An international forum, such as the *Central Asian Higher Education Week*, held annually and dedicated to higher education and scientific research. This event would serve as a regional anchor,

bringing together key stakeholders and showcasing achievements, as the SEA-HiEd Week²⁰³ in Southeast Asia or the RUFORUM Triennial,²⁰⁴ representing a network consisting of 129 universities in 38 African countries.

- Biannual symposiums focused on sharing best practices in higher education policy, providing an opportunity for experts to exchange knowledge and experiences.

Pillar 3.2. Harmonizing the higher education space

Actions and projects	Priority	Targets
<i>Development of effective mechanisms for the recognition of higher education, academic degrees and qualifications in Central Asia</i>	I	<ul style="list-style-type: none"> • Signing a regional convention on the recognition of diplomas and academic degrees, and developing mechanisms for its implementation • A network of information and consultation centers
<i>Simplification of learning outcomes record and transfer</i>	I	<ul style="list-style-type: none"> • Full-fledged transition to credit-modular system ECTS • Harmonization of requirements for recognition of educational credits • Piloting a procedure for automatic recognition of diplomas
<i>Digital ID for students and researchers</i>	II	<ul style="list-style-type: none"> • Unified format of ID and digital student profile
<i>Harmonization of national qualifications frameworks</i>	III	<ul style="list-style-type: none"> • Central Asia Regional Qualifications Framework

1. *Development of effective mechanisms for the recognition of higher education, academic degrees and qualifications in Central Asia.*

A regional convention on the recognition of qualifications is the most important instrument for the integration of a regional educational space. Many agreements on the recognition of qualifications have been signed in different regions worldwide. The most notable example is the 1997 Lisbon Recognition Convention, jointly developed by the Council of Europe and UNESCO. This convention is a key legal agreement for qualifications assessment in Europe and has been ratified by 55 countries. Similar conventions have also been implemented in other regions, such as the Addis Convention in Africa in 2019 and the Tokyo Convention in the Asia-Pacific region in 2018. A convention on the recognition of qualifications has also been signed by the Arab States in February 2022. These conventions are essential for enhancing mobility and stimulating integration at the regional level.

The adoption of such a convention in Central Asia, building on the principles of the Lisbon Recognition Convention, would be key to the creation a regional higher education space. This convention could cover the following areas:

- Mutual recognition of qualifications among countries that are parties to the convention, including for online and blended education,
- Facilitating access to higher education for students from third countries that are parties to the convention,
- Development of criteria and procedures for assessing qualifications and learning outcomes,
- Streamlining the recognition of diplomas and qualifications received from accredited HEIs for employment purposes.

Such convention would serve as an important document that consolidates and unifies the principles of the Central Asian Higher Education Area, which have already been partially formalized in different cross-

²⁰³ SEAMEO RIHED Southeast Asian Higher Education (SEA-HiEd) Week, URL: <https://rihed.seameo.org/portfolio/sea-hied-week/>

²⁰⁴ RUFORUM Triennial Conference, URL: <https://www.ruforum.org/Triennial2021/>

country treaties and declarations, including bilateral agreements. To effectively implement the provisions of the convention, it is recommended to develop a network of national information and advisory centers. The key function of these centers would be to provide methodological support to universities in implementing the principles embedded in the convention regarding the recognition of academic credentials, facilitating the alignment of learning outcome requirements, approving, and simplifying procedures for the recognition of diplomas, as well as preventing document forgery (see Box 7).

Box 7. ENIC-NARIC: a framework for harmonizing the higher education space

ENIC-NARIC is a cooperation project between national information centers for academic recognition of qualifications from 55 countries that operate in accordance with the Lisbon Recognition Convention (1997). The project was developed by the European Network of Information Centers (ENIC), established by UNESCO and the Council of Europe, and the National Academic Recognition Information Centers (NARIC) which were opened for the implementation of the Bologna process.

These networks accumulate and analyze information on national educational systems, qualifications, duration of education, diploma recognition mechanisms, and actively participate in consultation processes on international regulatory documents, recommendations, declarations, best practices, protocols, and models related to the recognition of qualifications. ENIC-NARIC also develops instruments for quality assurance and diploma recognition, including the implementation of projects aimed at addressing plagiarism and fraud in education.

An ENIC center operates in Kazakhstan: its objective is to provide methodological and informational support for the implementation of Bologna principles in the national higher education system. The center is also responsible for monitoring university activities related to the implementation of Bologna process principles as well and analyzing the practices and framework of international cooperation in higher education of Kazakhstan.

Sources: <https://www.enic-naric.net/page-about-ENIC-NARIC-Networks>, <https://enic-kazakhstan.edu.kz/ru>

2. Simplification of learning outcomes record and transfer.

Both national authorities and universities must collaborate to develop adequate regulations to facilitate the transparent and mutual recognition of learning outcomes and academic progress. A priority step in this direction is the complete transition to the credit-modular system, such as the ECTS. Special attention should be dedicated to providing students with opportunities to earn credits beyond the standard academic timelines, allowing credit accumulation. Alternatively, countries could consider signing an intergovernmental agreement on a simplified procedure for aligning university curricula based on scoring/credit units, instead of academic hours. Such agreement could include regulations to define a timeframe for recognizing academic credentials. In addition, it is important to unify ECTS weightings in the countries of the region.

Another important step for the harmonization of the Central Asian higher education space could be to pilot procedures for the automatic recognition of university diplomas. This would entail treating university qualifications from one country on an equal basis with local university diplomas for admission to further studies in another country. A prerequisite for automatic recognition could be, for example, the international accreditation or inclusion in global or reputable regional rankings. In the long term, it is recommended to develop methodologies for recognizing learning outcomes from non-formal education.

3. Digital ID for students and researchers.

This initiative aims to ensure that skills and qualifications acquired in Central Asian countries are recognized across the region and beyond. Many countries are now developing unique identifiers for university students, which is often considered as the first step towards developing digital platforms that aggregate and standardize information on educational credits, formal qualifications, skills and competencies, and professional experience. The creation of national identifiers in Central Asia would need to be coordinated to ensure operational compatibility for cross-country mobility. Unified IDs will help linking of educational, professional, and extracurricular outcomes received in Central Asian countries to a digital profile of a student or young professional. Such platforms will help reduce transaction costs in labor markets and ultimately address skill mismatches by enabling more effective hiring and mobility. Moreover, these platforms would also facilitate more flexible and personalized educational trajectories. It is recommended to synchronize the ID format and data architecture with the European platform *Europass* to enhance potential integration with the EHEA in the future.

Finally, in the longer term, this ID system could help develop a unified format of digital student identity card (analog of European Student Card). This card could be used to verify a student’s status in any Central Asian university and even beyond. Such cards can effectively manage students’ access to courses, research, and education infrastructure, both within the framework of inter-university cooperation and broader intergovernmental programs.

4. Harmonization of national qualifications frameworks.

Regional qualifications frameworks have been established in many countries to facilitate educational and labor mobility.²⁰⁵ For example, under CARICOM, Caribbean countries have implemented such a framework and agreed to waive labor visas/permits for university graduates from member countries of the community. These frameworks increase employer engagement in the development of education content and employment of graduates. They also mitigate issues of over-qualification for labor migrants who often have to work in positions that require lower qualifications than their foreign diplomas attest to. In addition, regional qualifications frameworks strengthen the signaling function of higher education.

A Central Asian qualifications framework could serve multiple functions, including:

- Harmonizing national qualifications frameworks, establishing and/or updating minimum general requirements for qualifications and corresponding learning outcomes,
- Ensuring alignment with the European Qualifications Framework (EQF) and promote labor mobility within Central Asia and across economic sectors,
- Enhancing transparency of qualifications, as well as simplifying skills evaluation procedures for businesses in case of transnational labor mobility,
- Establishing a benchmark for updating higher education curricula,
- Facilitating closer integration between vocational and academic tertiary education,
- Establishing a regional register of qualifications and developing a digital instrument for comparing qualifications across the region (*CEDEFOP NQFs online comparison tool* can be considered as a benchmark).

Pillar 3.3. Enhancing internationalization and intra-regional mobility

Actions and projects	Priority	Targets
<i>Central Asian Short-Term Mobility Program</i>	I	<ul style="list-style-type: none"> • Supporting short-term mobility for students and faculty members
<i>Supporting dual-degree programs and strategic university partnerships</i>	II	<ul style="list-style-type: none"> • Grant financing of dual-degree programs with leading regional and foreign HEIs • Supporting the establishment of branches of foreign universities and strategic partnerships among universities
<i>Increasing the attractiveness of the region for inbound student mobility</i>	III	<ul style="list-style-type: none"> • Brand of Central Asian education • A regional one-stop service for international students • Optimization of migration legislation

I. Central Asian Short-Term Mobility Program.

Mobility programs play a crucial role in the regionalization of higher education. According to Erasmus+, participation in exchange programs significantly increases graduates’ skills and improve their labor market integration. This, in turn, lead to a reduction in unemployment levels among program participants, with a

²⁰⁵ See, for example, The association of Southeast Asian nations qualifications reference framework, The economic community of West African states qualifications systems, The Caribbean community qualifications framework.

23% decrease observed five years after program completion compared to those who stayed solely with their home institutions.²⁰⁶

To further strengthen academic mobility in the region, outbound academic mobility programs available in the region would need to be expanded, with the inclusion of more universities from Central Asia. A group of leading universities in the region can collaborate to share their experience, including best practices from foreign universities, and provide fellowships for teaching and research staff from across the region. In the future, building on positive international experience, Central Asia can launch its own regional mobility program (see Box 8).

Box 8. Regional programs of short-term educational mobility

Asian International Mobility for Students (AIMS).

AIMS is student mobility program that operates among nine Southeast Asian countries. It is one of the flagship projects of the SEAMEO RIHED and brings together 80 universities. AIMS provides semester-long mobility opportunities for bachelor's students in 10 key areas of regional development, including agriculture, biodiversity, oceanology, economics, business, engineering sciences, sustainable environmental protection management, food industry, and tourism. More than 5,000 students have participated in the AIMS program since its launch in 2010.

Erasmus+ International Credit Mobility University (ICM)

In 2015, the Erasmus+ program launched the ICM program, which enables European universities to establish agreements on student and faculty mobility with partners outside of Europe. The program consists of four tracks that can be combined: academic student mobility (3-12 months), practice-oriented student mobility (2-12 months), faculty mobility (5 days-2 months), and mobility for improving qualifications.

Between 2015 to 2020, 270,000 people participated in the ICM, with 60% of the funding allocated to 34 participating countries (EU countries, Iceland, Lichtenstein, Norway, North Macedonia, Türkiye, Serbia), while 40% supported partner countries around the world.

Mobility in Asia Pacific program (UMAP)

UMAP was established in 1991 and includes 35 countries and territories of the Asia Pacific region, with more than 570 participating universities. This consortium of universities facilitates student exchange programs (including in an online format) and aims of fostering a better understanding of cultures, economies, and communities of member countries through establishing partner relationships and experience sharing.

UMAP offers both multilateral and bilateral formats for student exchange (1-2 semester), short-term programs (1-8 weeks), summer schools and research projects through Research Net, dedicated to studying student mobility and its impact on the regional economy (up to 6 months). UMAP also offers online multilateral student mobility programs through its Student Connection Online initiative, launched in 2008. An in-house credit system (UCTS), based on ECTS, is used for exchange programs. Agreements between educational institutions provide the provision of scholarships, eligibility for state financial support, and coverage of medical insurance expenditures.

Sources: https://umap.org/wp-content/uploads/2017/03/UMAP_25thSympReport.pdf, <https://erasmus-plus.ec.europa.eu/document/erasmus-international-credit-mobility>, <https://op.europa.eu/en/publication-detail/-/publication/7bda9285-5cc4-11ec-91ac-01aa75ed71a1/language-en>, <https://aims-rihed.net/>

A mobility program for Central Asia could have two tracks: one for students and another for teaching and research staff in HEIs. The student and postgraduate track would provide education at a partner university, with full recognition of courses and credits obtained abroad. A recommended period of mobility would be one semester. To increase efficiency, a blended mobility format can be adopted, combining physical mobility with a virtual component. For example, a virtual component could bring together students from different countries and disciplines within the same courses or work collectively on academic projects, while physical mobility could focus on receiving mentoring support from faculty members. Meanwhile, a track for teaching and research staff would offer short-term visits for teaching, development of research plans, preparation of publications, and collaboration on data at partner universities. Length here would be more flexible, depending on the purposes of the mobility.

To ensure the success of the Central Asian Short-Team Mobility Program, centralized funding and co-financing from universities would be necessary. Participating universities would be required to enter into mutual agreements that outline the mobility format (exchange or unilateral), funding arrangements, as well

²⁰⁶ Erasmus+ International Credit Mobility, URL: <https://erasmus-plus.ec.europa.eu/document/erasmus-international-credit-mobility>

as a procedure for accounting educational credits. Additional prerequisites for universities to participate in the program could include having an agreement with at least one partner university, having successfully undertaken international accreditation, and implementing ECTS.

2. Supporting dual-degree programs and strategic university partnerships.

One of the key elements for higher education internationalization is the establishment of dual-degree and joint educational programs. It is recommended for Central Asian countries to promote this practice, including through university alliances for instance (Action 3.1.4.). This can be achieved by providing grants for HEIs to develop dual-degree programs within the region and in collaboration with foreign universities, incorporating common mechanisms for education quality assurance. A collaborative effort between the Central Asian Association of Leading Universities (Action 3.1.3.) and organizations such as EHEA (through Erasmus+) or the ASEAN University Network can facilitate the launch such programs. Moreover, it is necessary to develop regional standards for education quality assurance specifically designed for dual-degree programs. There are international examples such standards, such as the *European Approach for Quality Assurance of Joint Programmes*,²⁰⁷ developed by ENQA in 2014.

In addition to creating joint programs, opening branches of foreign HEIs and distributed campuses are also important internationalization strategies. Many universities from high-income countries have already opened branches in countries such as India or Malaysia. Through these branches, these universities provide students with access to quality education and a foreign degree without having to study abroad and incur the associated costs. Many branches of foreign universities have already been set up in Central Asian countries, and authorities could expand this practice by further supporting their establishment. Several instruments are available to encourage this practice, including:

- Tax benefits for newly established universities,
- Technical support from authorities
- Simplified monitoring procedures for compliance with state requirements in the first 1-3 years of operation,
- Concessional long-term rent of real estate and payment by installments for rent payments.

One of the international benchmarks that could be useful for Central Asian countries is the Dubai Knowledge Village – the only free economic zone in the world that specializes in human capital development, vocational training and higher education. This zone offers attractive incentives, such as 100% ownership of established companies, 100% income tax exemption for 50 years, 100% income repatriation, zero customs duties, and other benefits to organizations implemented there. Central Asian countries can consider the possibility of using similar free economic zones for educational services, reducing investments in infrastructure for branches of foreign universities, enabling them to register through a simplified procedure, and offering reduced tax rates.

To effectively pursue their internationalization strategies, Central Asian universities should establish comprehensive strategic partnerships for joint educational and research activities with foreign universities that share the same mission and comparable academic performance. Strategic partnerships do not necessarily require substantial financial contributions, but political support from national authorities is essential, as well as technical support that can be provided by the Central Asian Regional Center for Higher Education and Skills (see Action 3.1.2.). One successful case of cross-country strategic partnership is the University of Central Asia (see Box 9).

²⁰⁷ European Approach for Quality Assurance of Joint Programmes, URL: <https://www.eqar.eu/kb/joint-programmes/>

Box 9. University of Central Asia: strategic partnership for quality and inclusion.

The University of Central Asia (UCA) is a private university established in 2000 through the joint efforts of Kyrgyzstan, Tajikistan, Kazakhstan, and His Highness the Aga Khan. UCA focuses on education and scientific research that foster socio-economic development in Central Asia, while preserving and developing the cultural traditions of Central Asian nations. The Aga Khan Development Network provides significant support to UCA, and the university collaborates closely with several leading universities from Canada, Australia, the United Kingdom, Russia, and over 60 other development organizations, private funds, companies, research institutions, and universities.

UCA consists of three schools: the School of Arts and Sciences, which offers bachelor's programs in computer Science, communications and media, economics, earth and environmental sciences; the School of Professional and Continuing Education, which provides 450 vocational and re-training modules in 14 training centers across 10 cities in the region; and the Graduate School of Development, which hosts three research centers on public administration, mountain community development, and regional social science. The Graduate School of Development implements the "Civil Society Initiative." The objective of this program is to develop institutional and leadership capacity within the region and to increase community engagement in addressing development challenges in education, healthcare, public administration, and ecology. The Aga Khan Humanities Project focuses on developing critical thinking skills and research abilities in humanities through partnerships with 87 public educational institutions in Tajikistan, Kyrgyzstan, and Kazakhstan. Since 1997, more than 180,000 individuals have completed the program.

UCA is committed to increase the accessibility of quality higher education in Central Asia. In addition to providing financial assistance to all students through grants, scholarships, and interest-free loans, UCA has developed a preparatory program in collaboration with Seneca College (Canada) to improve academic success in the first year of the bachelor's program. The program includes courses on mathematics, natural sciences, and English language. Bachelor's program curricula include modules that prepare students for continuing education at master's level. With its specific focus on developing mountain communities, UCA has established two campuses in Naryn (Kyrgyzstan) and Khorog (Tajikistan) that offer accommodation for students and faculty. A third campus in Tekeli (Kazakhstan) is currently in development. Today, 70% of UCA students come from small cities and rural areas, 51% are women, and more than 80% are citizens of Central Asian countries.

Source: [University of Central Asia - University of Central Asia \(ucentralasia.azurewebsites.net\)](http://ucentralasia.azurewebsites.net)

3. Increasing the attractiveness of the region for inbound student mobility.

As previously mentioned, Central Asia attracts only a limited number of foreign students and has a net deficit in student mobility. To tackle this situation, three solutions could be envisaged:

First, Central Asia should position itself as an attractive region for the education of foreign students. To achieve this, Central Asian countries could for example create a brand for Central Asian education, such as *Study in Central Asia*. This would require a joint marketing strategy to promote the region's brand and joint educational programs. Such brands were successfully developed at the national level in different countries, with initiatives such as Study in Germany, Study UK, Study Australia.

Second, admission procedures and application processes for foreign students should be streamlined and optimized to encourage more applications. One promising solution could be the establishment of a one-stop digital service at the regional level to assist foreign students with information on admission requirements, accommodation, visa procedures, as well as nostrification. In the future, this service could also facilitate the preliminary selection and application submission to regional HEIs.

Finally, it is essential to encourage foreign students to contribute to the Central Asian economy upon their graduation. This would require optimizing migration legislation, as well as simplifying visa requirements for foreign students. Measures could include extending the period of visa-free stay in the country during the university application process, implementing automatic and simplified visa extensions, and extending the validity period of visas for job-seeking purposes after graduation.

Roadmap

The Roadmap presents a summary of strategic pillars, comprising recommended *Actions and Projects*. The *Priority* column ranks them in order of importance, with I indicating the highest priority and III denoting the lowest. The *Timeline* column assesses the expected implementation timeframe for each Action, categorized as short-term (ST), medium-term (MT), and long-term (LT). The *Resources* column provides an estimation of the required financial and organizational resources for each Action, classified as low (L), medium (M), and high (H). The *Targets* column highlights the key outcomes that can be achieved under the corresponding Action. Finally, the *Reference countries* column indicates the countries for which each Action is the most relevant, namely Kazakhstan (KZ), Kyrgyzstan (KG), Tajikistan (TJ) and Uzbekistan (UZ), and for supranational Actions that require cross-country cooperation across most of Central Asia, Central Asia (CA). The Roadmap concludes with General Institutional Prerequisites concerning financing and governance, which are crucial for the effective implementation of the proposed recommendations.

	Actions and projects	Priority	Timeline	Resources	Targets	Reference countries
Priority Policy Area I. Improving access, quality, and relevance of higher education						
Pillar 1.1. Ensuring effective external and internal quality assurance						
1.1.1.	<i>Developing regional accreditation standards</i>	I	ST	L	<ul style="list-style-type: none"> • Adoption of regional accreditation standards for Central Asia • Transition to external accreditation • Pool of world-class experts in higher education quality assurance 	CA
1.1.2.	<i>Promoting effective internal quality assurance units and tools</i>	II	MT	M	<ul style="list-style-type: none"> • Aligned framework requirements for internal quality assurance • Launch of university centers of institutional research and internal instruments for teaching quality assessment by students in the leading HEIs 	KZ, UZ, KG, TJ
1.1.3.	<i>Establishing the Central Asian Accreditation Agency (a regional network of agencies).</i>	II	MT	H	<ul style="list-style-type: none"> • Launch of the Central Asian Accreditation Agency 	CA
1.1.4.	<i>Developing sectoral higher education quality standards</i>	III	LT	H	<ul style="list-style-type: none"> • Sectoral accreditation standards for distance learning, for master's programs, and for sectoral disciplines 	UZ, KG, TJ

					<ul style="list-style-type: none"> • Modernization of extramural (part-time) education: engagement of employers, increasing face-to-face contact, distance/hybrid form of education 	
1.1.5.	<i>Initiating an objective cross-country comparison of educational quality and learning outcomes</i>	III	LT	H	<ul style="list-style-type: none"> • Participation of the countries of the region in international competence assessment • Framework for aligned grading scales of standardized final examinations of high school students 	CA
Pillar 1.2. Enhancing the effectiveness and the quality of teaching						
1.2.1.	<i>Increasing the attractiveness and the effectiveness of the teaching profession</i>	I	MT	M	<ul style="list-style-type: none"> • Average salary of HEI's teaching staff is higher than the average salary in the region • Model remuneration scheme for teaching staff that considers publication activity and students' learning outcomes • Efficient contracts with teaching staff • Ensuring functional differentiation of faculty members • Reducing teaching load of teaching staff • Increasing the share of research institutes employees among HEI faculty members 	UZ, KG, TJ
1.2.2.	<i>Developing an integrated labor market for academic staff</i>	II	MT	M	<ul style="list-style-type: none"> • Decentralization of teaching staff recruitment procedures • Regional online portal for teaching and research vacancies 	CA
1.2.3.	<i>Developing modern teaching skills and methods</i>	III	MT	H	<ul style="list-style-type: none"> • Inter-university methodological center for teaching excellence • Continuous professional development programs on modern teaching methods and language proficiency 	KZ, UZ, KG, TJ
Pillar 1.3. Widening participation and access to higher education						
1.3.1.	<i>Including social inequality in the educational policy agenda</i>	I	ST	L	<ul style="list-style-type: none"> • Launching a monitoring of the social composition of student bodies 	KZ, KG, TJ

					<ul style="list-style-type: none"> Accounting for social indicators in funding formulas, grants, targeted admission, and education loans 	
1.3.2.	<i>Developing distance/virtual education</i>	II	MT	H	<ul style="list-style-type: none"> Online education platform of Central Asia 	CA
1.3.3.	<i>Targeted assistance to groups at risk and talent support</i>	III	LT	H	<ul style="list-style-type: none"> National programs for residents of rural territories, talented children from disadvantaged families, first-generation students 	KZ, UZ, KG, TJ
Pillar 1.4. Ensuring the relevance of higher education						
1.4.1.	<i>Training Central Asia's future workforce</i>	I	MT	M	<ul style="list-style-type: none"> Forecasting regional labor market Implementing graduate tracking systems at the national and regional levels Setting priorities of public funding of HEIs in line with future labor market and demographic trends Expanding admission to master's and STEM programs 	KZ, UZ, KG, TJ
1.4.2.	<i>Developing and updating skills for the modern economy</i>	II	MT	M	<ul style="list-style-type: none"> Disseminating project-based education Including green skills in curricula Launching regional mass online courses on coding, machine learning and computer literacy 	UZ, KG, TJ
1.4.3.	<i>Curricula modernization</i>	III	LT	H	<ul style="list-style-type: none"> Pilot redesign of programs on the most popular and priority disciplines Granting HEIs the autonomy to design their own educational programs, for those that have completed external accreditation Engaging business in the modernization of curricula Transition to outcome-based education 	UZ, KG, TJ
Priority Policy Area II. Strengthening research and innovation capacity						
Pillar 2.1. Increasing research productivity of academic staff						

2.1.1.	<i>Providing incentives to enhance research productivity</i>	I	ST	L	<ul style="list-style-type: none"> • Introducing metrics for the assessment of effectiveness of publication activity • Provision of financial incentives for publication activity • Establishing a hub of data and methods 	UZ, KG, TJ
2.1.2.	<i>Strengthening publication infrastructure</i>	II	ST	M	<ul style="list-style-type: none"> • New Central Asian journals in regional areas of research specialization • Promoting Central Asian journals in international research and citation databases • Ensuring access to leading international citation databases and research libraries • Launching a regional center for academic writing 	CA
2.1.3.	<i>Promoting academic ethics</i>	III	LT	L	<ul style="list-style-type: none"> • Centralized access to digital anti-plagiarism service • Whitelists of journals • Regional charter of academic ethics 	CA
Pillar 2.2. Building research capacity and excellence in higher education institutions						
2.2.1.	<i>Establishing a network of centers of excellence</i>	I	MT	H	<ul style="list-style-type: none"> • Establishing a regional network of centers of excellence across Central Asian countries to collaborate on critical developmental challenges and priority sectors for the region 	CA
2.2.2.	<i>Regional infrastructure for supporting cooperation between universities and research institutes</i>	I	ST	M	<ul style="list-style-type: none"> • Launching a Central Asian research support fund • Establishing uniform and transparent rules for competing for research funding • Coordinated research programs, joint dissertation councils and academic journals, joint research and infrastructure between universities and research institutes • Regional centers for shared-usage of research infrastructure 	CA

2.2.3.	<i>Modernizing scientific personnel training</i>	II	MT	M	<ul style="list-style-type: none"> • Full implementation of a Ph.D. model • Possibility to defend a thesis based on the publication of scientific articles • Increasing scholarships for Ph.D. students • Incentivizing professors, which do not have an academic degree, to obtain a Ph.D. 	KG, TJ
2.2.4.	<i>Forming a pool of world-class researchers</i>	III	MT	H	<ul style="list-style-type: none"> • Regionwide competition for attracting postdoctoral fellows • A program for brain repatriation 	CA
Pillar 2.3. Strengthening linkages between universities and industry						
2.3.1.	<i>Expanding technology transfer capacity</i>	I	MT	M	<ul style="list-style-type: none"> • Grants for small-scale prototyping and matching grants for university startup teams • Integrating universities in emerging national innovation ecosystems • Launching national offices/departments for transfer of university technologies • Training a pool of technology transfer specialists • Benefits for enterprises participating in PPPs for developing innovative infrastructure in HEIs 	KZ, UZ, KG, TJ
2.3.2.	<i>Developing new cooperation formats and incentives for industry and universities</i>	II	MT	M	<ul style="list-style-type: none"> • Scientific expert panels in the largest state-owned enterprises • Industry-oriented dissertations • Work-integrated learning modules • Opportunities for transition to teaching positions from the industry 	KZ, KG, TJ
2.3.3.	<i>Systematizing scientific and technical information and aggregating business requests for research and development</i>	II	LT	L	<ul style="list-style-type: none"> • Harmonization of data on innovations • Regional database of scientific and technical information • Central Asian Innovation Scoreboard 	CA

					• Long-term scientific and technological forecast for Central Asia	
Priority Policy Area III. Advancing instruments for an integrated regional higher education area						
Pillar 3.1. Establishing regional cooperation infrastructure						
3.1.1.	<i>Aligning strategic priorities for higher education development across Central Asian countries</i>	I	ST	M	• Aligned strategy for higher education development in Central Asia	CA
3.1.2.	<i>Securing political and institutional support for regional cooperation</i>	I	ST	M	• Central Asian Higher Education Council • Central Asian Regional Center for Higher Education and Skills	CA
3.1.3.	<i>Promoting and supporting the creation of the Association of Leading Universities of Central Asia</i>	II	ST	M	• Association of Leading Universities of Central Asia	CA
3.1.4.	<i>Promoting the establishment of university alliances</i>	II	MT	H	• Establishing incentives and projects for supporting the creation of university alliances of Central Asia	CA
3.1.5.	<i>Developing a plan of regular meetings and events.</i>	II	ST	M	• A plan of meetings and events: summit, symposium on quality in education, conference of partners, international higher education forum	CA
Pillar 3.2. Harmonizing the higher education space						
3.2.1.	<i>Development of effective mechanisms for the recognition of higher education, academic degrees and qualifications in Central Asia</i>	I	ST	M	• Signing a regional convention on the recognition of diplomas and academic degrees, and developing mechanisms for its implementation • A network of information and consultation centers	CA
3.2.2.	<i>Simplification of learning outcomes record and transfer</i>	I	MT	M	• Full-fledged transition to credit-modular system ECTS • Harmonization of requirements for recognition of educational credits	CA

					<ul style="list-style-type: none"> • Piloting a procedure for automatic recognition of diplomas 	
3.2.3.	<i>Digital ID for students and researchers</i>	II	MT	M	<ul style="list-style-type: none"> • Unified format of ID and digital student profile 	CA
3.2.4.	<i>Harmonization of national qualifications frameworks</i>	III	LT	H	<ul style="list-style-type: none"> • Central Asia Regional Qualifications Framework 	CA
Pillar 3.3. Enhancing internationalization and intra-regional mobility						
3.3.1.	<i>Central Asian Short-Term Mobility Program</i>	I	ST	M	<ul style="list-style-type: none"> • Supporting short-term mobility for students and faculty members 	CA
3.3.2.	<i>Supporting dual-degree programs and strategic university partnerships</i>	II	MT	M	<ul style="list-style-type: none"> • Grant financing of dual-degree programs with the leading regional and foreign HEIs • Supporting the establishment of branches of foreign universities and strategic partnerships among universities 	CA
3.3.3.	<i>Increasing the attractiveness of the region for inbound student mobility</i>	III	MT	M	<ul style="list-style-type: none"> • Brand of Central Asian education • A regional one-stop service for international students • Optimization of migration legislation 	CA
General Institutional Prerequisites: Financing and Governance						
1.	<i>Attracting additional investments in higher education systems</i>					KZ, UZ, KG, TJ
2.	<i>Developing digital infrastructure to improve resource efficiency and governance.</i>					KZ, UZ, KG, TJ
3.	<i>Strengthening university management capacity.</i>					KZ, UZ, KG, TJ
4.	<i>Results-oriented approach to university management and staffing.</i>					KZ, UZ, KG, TJ
5.	<i>Enhanced financial and managerial autonomy of universities:</i>					KZ, UZ, KG, TJ

Annexes

A. Charts and Tables

Table A.1. Higher Education Funding in Central Asian countries.

	Kazakhstan	Tajikistan	Kyrgyzstan	Uzbekistan
Public funding of tertiary education (in % of GDP, 2018-2022)	0.2%	0.61%	0.18%	0.89%
Public funding of higher education (ISCED 6-8, % of GDP, 2020-2021)	n.a.	0.5 %	n.a.	0.36%
Total higher education funding per student (US\$, 2015-2022)	3360	585.5	n.a.	845
Share of university revenues from tuition fees (% , 2017)	40-50%	Na	n.a.	68.4%
Current expenditures, % of the total expenditures of public HEIs (2017-2022)	98%	99.8%	97.7%	100%
Current expenditures, excluding salary and wages, % of the total expenditures in public HEIs (2017-2022)	49%	12.8%	12.8%	11%
Share of students in public HEIs (% , 2019-2021)	23%	96.5%	86%	95%
Share of students who pay tuition fees (% , 2017-2021)	66%	74.6%	89%	83%
Share of students who receive state scholarships for payment of tuition fees (% , 2017-2021)	34%	25.4%	10.1%	17%
Typical annual tuition fees in public/private HEIs (US\$, 2022)	1,000-2,000 / 10,000-12,000	250-1,250 / 400-9,000	400 / 6,000	800/2,600
Typical state grant to pay for higher education, % of average tuition fees	150%	100%	87%	100%
Share of students who take an educational loan, %	Less than 1%	n.a.	n.a.	n.a.

Source: see footnote²⁰⁸

²⁰⁸ *Public financing of tertiary education (in % of GDP)*. Kazakhstan, 2018: according to the data from the World Bank database. Government expenditure on tertiary education as % of GDP; Tajikistan, 2020: according to data from the Agency on Statistics under the President of the Republic of Tajikistan and World Bank (2022). Public Expenditure Review; Kyrgyzstan, 2021: according to data from Ministry of Education and Science of Kyrgyz Republic; Uzbekistan, 2022: authors' calculations based on the data on GDP forecast and planned expenditures for tertiary education in 2022, Information Publication "Citizens' Budget", that is dedicated to the budget approved for 2022, prepared by the Ministry of Finance in conjunction with UNDP.

Public financing of higher education (ISCED 6-8, % of GDP, 2020-2021). Tajikistan, 2020: according to the data from the Agency on Statistics under the President of the Republic of Tajikistan and World Bank (2022). Public Expenditure Review; Uzbekistan, 2022: according to the data from the Agency on Statistics under the President of the Republic of Tajikistan, URL: <https://stat.uz/uz/matbuot-markazi/qo-mita-yangiliklar/17435-o-zbekistonda-2021-yilda-valpi-ichki-mahsulot-necha-foizga-o-sdi>
Total higher education financing per student (US\$) Kazakhstan, 2017: authors' calculation based on the data from (1) OECD (2017). Higher Education in Kazakhstan 2017. Reviews of National Policies for Education. OECD Publishing, Paris; (2) World Bank; (3) Bureau of National Statistics of the Ministry of National Economy of the Republic of Kazakhstan, URL: <https://stat.gov.kz/>; Tajikistan, 2015: based on the data from UNESCO Statistics, URL: <http://data.uis.unesco.org/#>; Uzbekistan, 2021: based on the data from UNICEF (2021). Uzbekistan Education Sector Analysis: 2021, URL: https://uzbekistan.un.org/sites/default/files/2022-05/Edu%20Sit%20An_UNICEF%202022_0.pdf;

Table A.2. Inbound and outbound student mobility in Central Asian countries (2019-2020)

	Outbound mobility, total, 2020	Inbound mobility, total	Outbound mobility to Central Asian countries, 2020	Net mobility (% , 2018-2020) ²⁰⁹
Kazakhstan	90,333	40,742 (2020)	2,455	- 6.7% (2020)
Tajikistan	27,978	2,238 (2017) ²¹⁰	2,682	- 6.6% (2017)
Kyrgyzstan	13,307	36,596 (2020) ²¹¹	1,176	9.9% (2020)
Uzbekistan	85,876	4,212 (2021)	61,701	- 13.9% (2018)

Source: UNESCO statistics. URL: <http://data.uis.unesco.org/#>

Share of university revenues from tuition fees in the total university revenues (% , 2017). Kazakhstan, 2017: European Commission (2017). Overview of the Higher Education System in Kazakhstan, URL: https://erasmusplus.kg/en/wp-content/uploads/2015/02/countryfiche_kyrgyzstan_2017.pdf; Uzbekistan, 2016/2017: Kholmuminov, S., Kholmuminov, S., & Wright, R. E. (2019). Resource dependence theory analysis of higher education institutions in Uzbekistan. Higher Education, 77, 59-79.

Current expenditures, % of the total expenditures in tertiary public institutions (2017-2022). According to the data from the World Bank database. Indicator: Current expenditure as % of total expenditure in tertiary public institutions. Note: Kazakhstan – 2018, Tajikistan – 2017, Kyrgyzstan – 2019, Uzbekistan – 2020.

Current expenditures, except for salary and wages, % of the total expenditures in tertiary public institutions (2017-2022). According to the data from the World Bank database. Indicator: Current expenditure other than staff compensation as % of total expenditure in tertiary public institutions. Note: Kazakhstan – 2018, Tajikistan – 2017. For Kyrgyzstan, 2017: UNESCO. Education Indicators – Humanitarian Data Exchange, URL: https://data.humdata.org/m/dataset/unesco-data-for-kyrgyzstan?force_layout=light; For Uzbekistan, 2022: based on the data from Open Data Portal, URL: <https://data.egov.uz/rus/spheres/607fea9a7b6428eee08802b2?page=2>

Share of students in public HEIs, %. Kazakhstan, 2021: Bureau of National Statistics of the Ministry of National Economy of the Republic of Kazakhstan, <https://stat.gov.kz/>; Tajikistan, 2021: Agency on Statistics under President of the Republic of Tajikistan. (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe; Kyrgyzstan, 2018: based on the data from the National Statistical Committee of the Kyrgyz Republic, URL: <http://www.stat.kg/ru/publications/sbornik-obrazovanie-i-nauka-v-kyrgyzskoj-respublike/>; Uzbekistan, 2021: based on the data from the Agency of Statistics under the President of the Republic of Uzbekistan, URL: <https://stat.uz/ru/ofitsialnaya-statistika/social-protection>

Share of students who pay tuition fees (% , 2017-2021). Kazakhstan, 2021: according to data from the Bureau of National statistics of the Agency for Strategic planning and reforms; Tajikistan, 2021: Agency on Statistics under President of the Republic of Tajikistan. (2022). Education in the Republic of Tajikistan. Statistical Yearbook. Dushanbe; Kyrgyzstan, 2017: based on the data from the National Statistical Committee of the Kyrgyz Republic.

Share of students who receive state scholarships for payment of tuition fees (% , 2017-2021): ibid

Typical annual tuition fees in public / private HEIs (US\$, 2022). Kazakhstan: authors' calculations based on the data of the Ministry of Science and Higher Education of the Republic of Kazakhstan; Tajikistan, 2021: based on the data from National Testing Center under the President of the Republic of Tajikistan, List of professions with tuition fees (including branches of foreign HEIs, and University of Central Asia), URL: <https://stat.ntc.tj/Home/RPlan>; Kyrgyzstan: authors' calculations based on the data from the Ministry of Education and Science of the Kyrgyz Republic; Uzbekistan: based on the data from UZ.News, URL: <https://uznews.uz/posts/58186>

Typical state grant to pay for education, % of average tuition fees. Kazakhstan: authors' calculations based on the data from the Ministry of Science and Higher Education of the Republic of Kazakhstan. Tajikistan, Kyrgyzstan, Uzbekistan - based on information from national legislation.

Share of students who use an educational loan, %. Kazakhstan: based on the data from the Financial Center, Overview of Higher Education by AlmaU University, URL: https://almau.edu.kz/news/vysshee_obrazovanie_rk_reformirovat_nelzya-12844

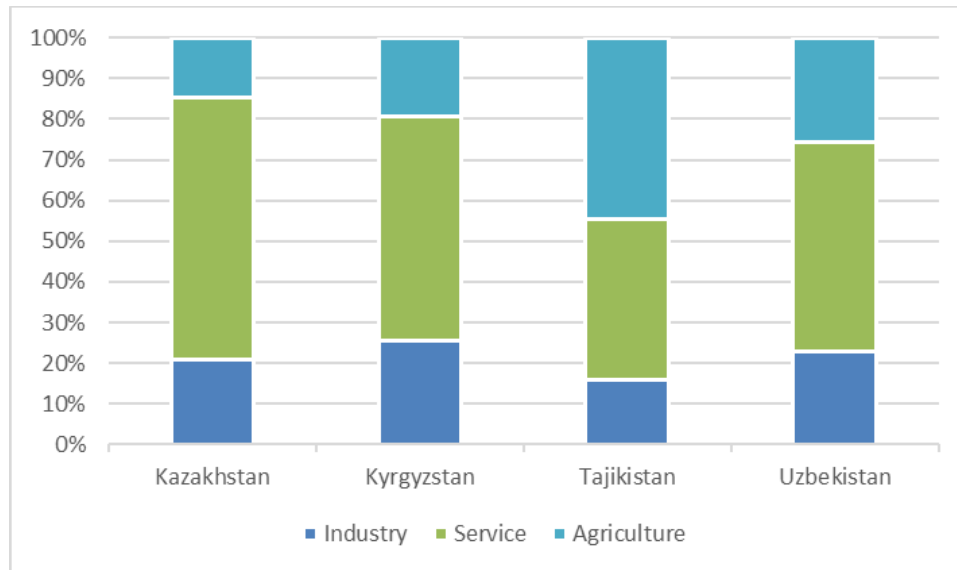
²⁰⁹ Net flow of international mobile students (inbound – outbound). UIS

²¹⁰ According to the statistical collection “Education in the Republic of Tajikistan.” 2022, in 2020 4,803 foreign citizens entered HEIs of Tajikistan.

²¹¹ At the beginning of 2021/2022 academic year 83 thousand foreign students have been studying at higher vocational educational institutions, or more than 35% in the total number of students. The vast majority - more than 59 thousand people, or 71% - were students from CIS countries, which number over the last five years increased by 7.7 times.

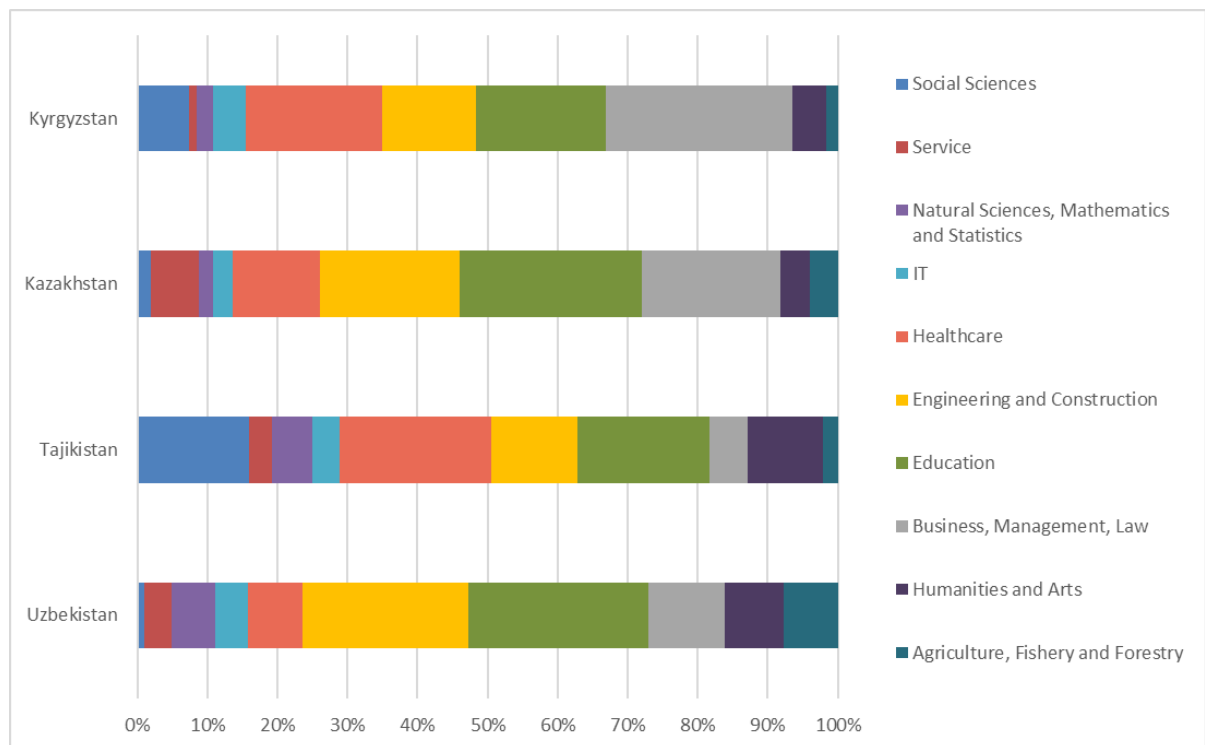
<https://bilim.akipress.org/ru/news:1762817/?f=cp>

Figure A.1. Population's employment structure (2020)



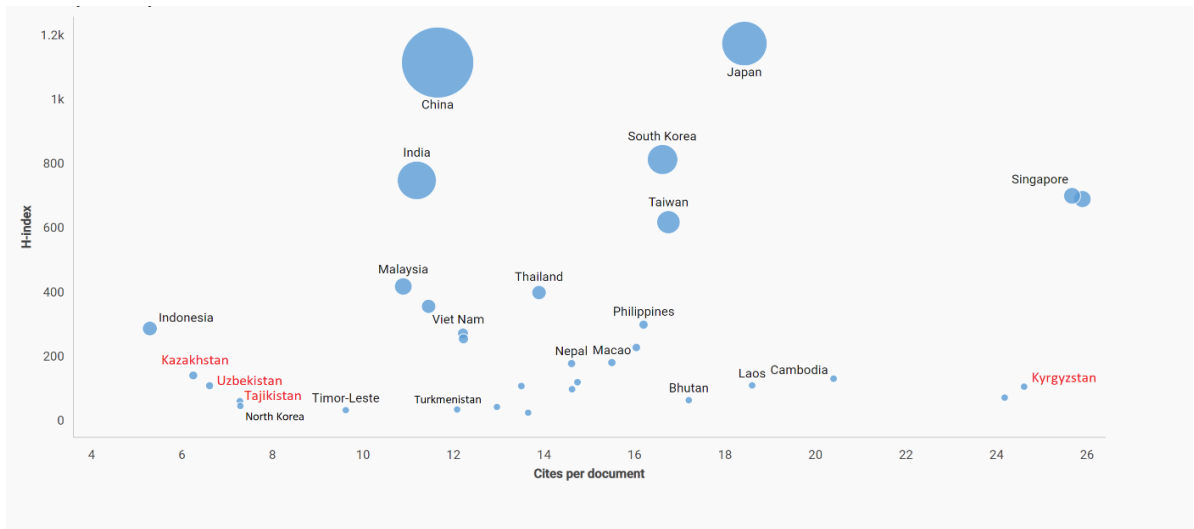
Source: International Labour Organization's database, URL: <https://www.ilo.org/global/statistics-and-databases/lang--en/index.htm>

Figure A.2. Tertiary graduates by fields of study in Central Asian countries (2021)



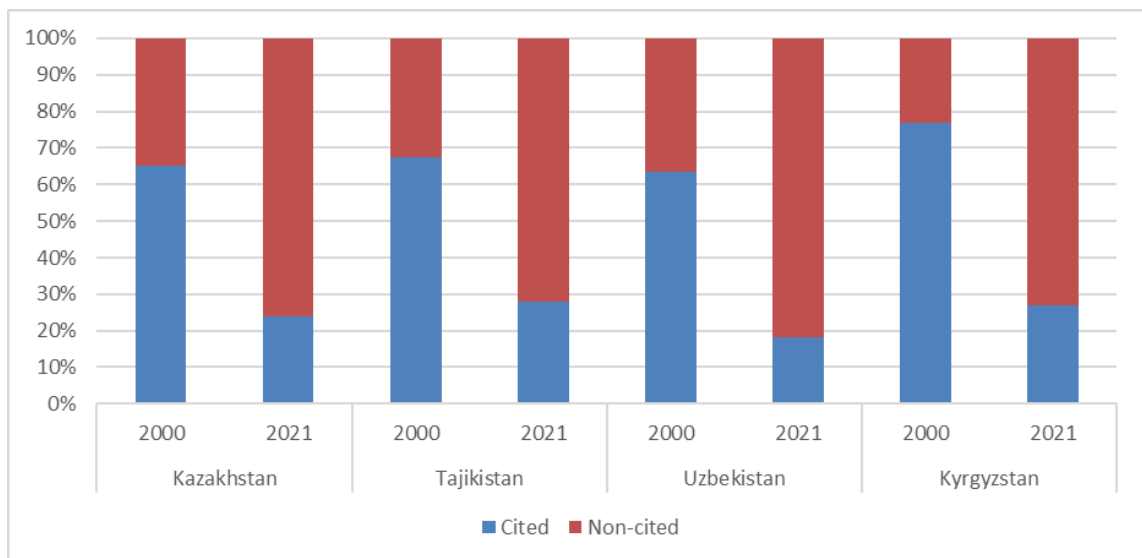
Source: World Bank data. Education Statistics - All Indicators. URL: shorturl.at/xyKL2

Figure A.3. Impact (h-index)²¹² and citation per publication in Central Asia and comparator countries, all disciplines (1996-2021)



Source: SJR World Report, URL: <https://www.scimagojr.com/worldreport.php?w=Asiatic%20Region>

Figure A.4. Share of cited and non-cited publications of authors from Central Asian countries in academic journals,²¹³ all disciplines (2000-2021)

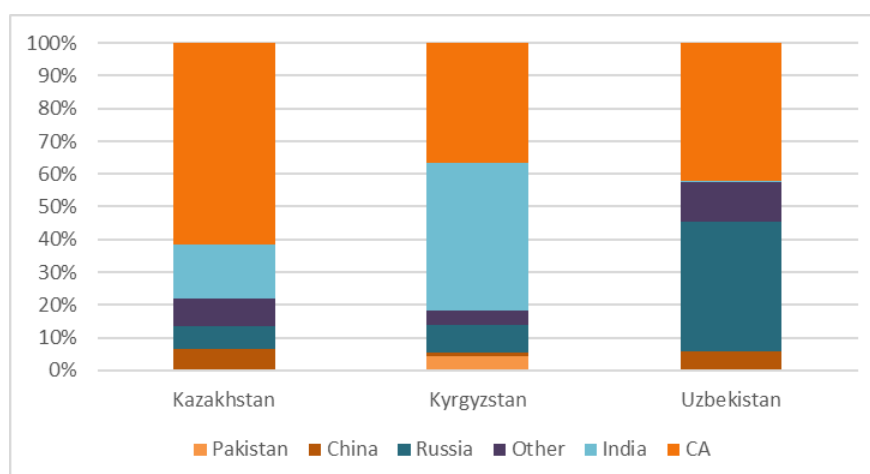


Source: based on the data from SJR, URL: [https://www.scimagojr.com/comparecountries.php?ids\[\]=kz&ids\[\]=tj&ids\[\]=uz&ids\[\]=kg](https://www.scimagojr.com/comparecountries.php?ids[]=kz&ids[]=tj&ids[]=uz&ids[]=kg)

²¹² H-index is the Hirsch index, a scientometric indicator, a quantitative parameter of productivity of scientists in a country; it is based on the number of publications and the number of citations of the publications thereof.

²¹³ Cited documents: the number of documents cited at least once over the three previous years, i.e. for the years X-1, X-2 and X-3; non-cited documents: the number of non-cited documents over the three previous years, i.e. for the years X-1, X-2 and X-3

Figure A.5. Foreign students in Kazakhstan, Kyrgyzstan and Uzbekistan by countries of origin (2019)



Source: UNESCO statistics. URL: <http://data.uis.unesco.org/#>

B. Socio-economic Context of Central Asia

After the collapse of the Soviet Union and the market transition, Central Asian countries faced significant economic and political challenges. Over the past two decades, they managed to stabilize the political situation, to find their own model for economic growth, and to establish the role of higher education in new economic realities. On average, Central Asia has achieved an impressive economic growth during the post-Soviet transition, with labor productivity increasing by almost 5% until 2015, and poverty levels almost halving.²¹⁴ The recovery after the recession at the beginning of 1990s was withdriven by political reforms, including enhanced international integration and private sector development, as well as increased effectiveness of resource allocation.²¹⁵

Over the last two decades, economic growth in the region has outpaced the global average. In absolute terms, the region's GDP has grown by seven and a half times, and in real terms, by four times between 2000 and 2021.²¹⁶ According to World Bank classification, Kyrgyzstan, Tajikistan and Uzbekistan belong to the group of lower-middle income countries, except with Kazakhstan and Turkmenistan qualifying as upper-middle income countries. While Central Asian states found themselves at different levels of economic development, they share a lot of common challenges, historically shaped advantages and limitations. Below there is an overview of key indicators of socio-economic development in Central Asia, which are important for developing a vision of the future of higher education in the region.

A key driver of economic growth in the region is exports of minerals and labor force. Being rich in minerals and hydrocarbons, the region serves as a large transit zone that supplies the global economy with critical commodities such as oil, gas, coal, metals, and agricultural products. Central Asia's logistical advantages of being located between European and Asian markets, including its proximity to China, enabled the region to build on fast growing demand for hydrocarbons and metals. Substantial increases in global prices for energy and metals have attracted foreign direct investments in the oil and gas extractive industry and in transportation infrastructure, which resulted in the rapid growth of exports, especially in Kazakhstan and Uzbekistan. Mineral raw materials account for more than half of exports of commodities in the region. However, the structure of exports in each country differs. Oil and energy exports account for 60% of exports from Kazakhstan, however exports of metallurgy products are also developed. Kyrgyzstan and Uzbekistan mainly export gold and food products. Tajikistan, apart from gold, also exports ore metals and concentrates.²¹⁷

²¹⁴ OECD. (2018). Enhancing Competitiveness in Central Asia. URL: <https://www.oecd-ilibrary.org/development/9789264290129-ru>

²¹⁵ *ibid*

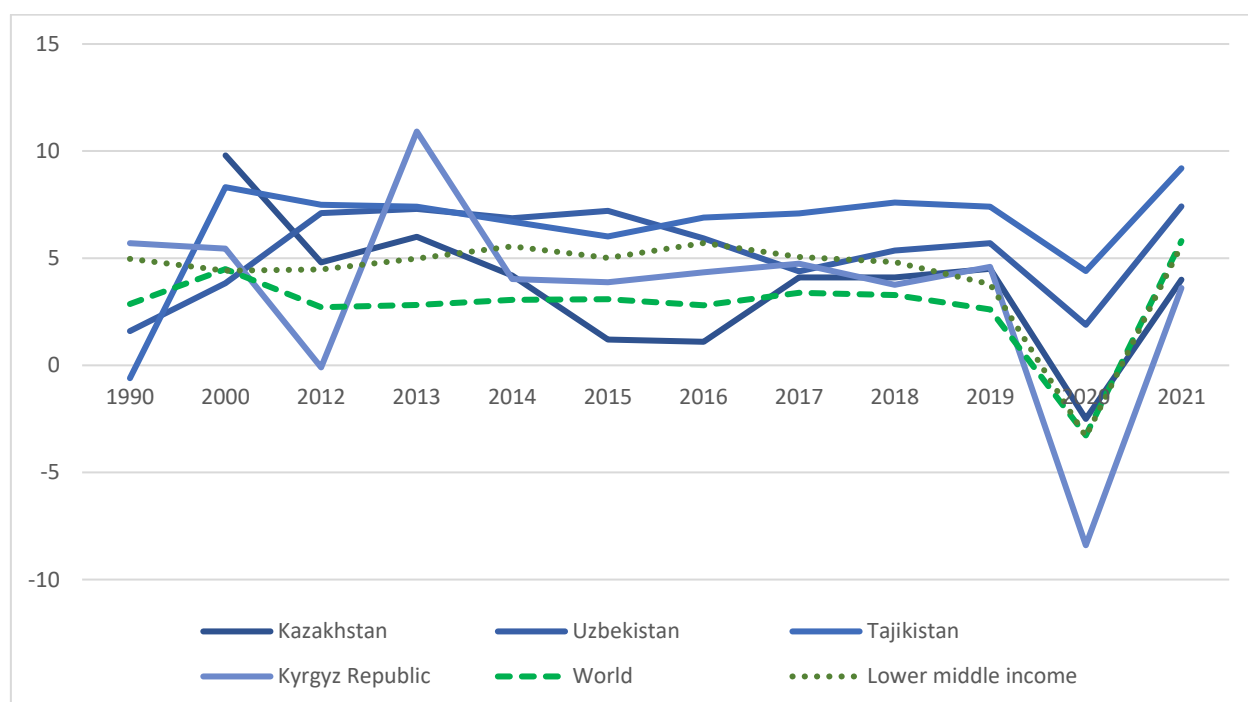
²¹⁶ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²¹⁷ Data for 2021. Source: Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

Inflow of remittances from labor migrants who mainly leave the region’s countries to work in Russia and Kazakhstan, remains an important source of economic stability. In 2021 remittances accounted for 30% of GDP in Kyrgyzstan, 27% of GDP in Tajikistan, and 12% of GDP in Uzbekistan.²¹⁸ Labor migration is mostly unskilled, and remittances are especially critical for vulnerable groups. In Tajikistan, remittances account for approximately 71% of the income of poor households that receive them, while in Kyrgyzstan, the figure is up to 28%.²¹⁹ However, during the pandemic, these inflows have decreased significantly because of mobility restrictions. Many labor migrants from Central Asia have lost their jobs, faced substantial decreases in salary, or were forced to go on an unpaid leave.²²⁰

Central Asian countries are actively integrating into the global economy. By 2021, the accumulated volume of foreign direct investments in the region was equal to US\$200 billion. Turnover of foreign trade in goods of Central Asian countries was equal to US\$165.5 billion in 2021, a twenty-fold increase over 20 years. Meanwhile, Kazakhstan accounts for more than 60% of this turnover, Uzbekistan accounts for the fifth part, while Tajikistan and Kyrgyzstan each account for less than 5%.²²¹

Figure B.1. Annual GDP growth, % (1990 – 2021)



Source: based on the data from the World Bank database, URL: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

The Central Asian region has faced a deteriorating foreign trade balance due to higher import growth rates.²²² Meanwhile, the share of services accounts for only one tenth of foreign trade turnover of the countries in the region. The key trade partners in the region are Russia and China. Moreover, the region is largely isolated from key global economic centers such as North America, Western Europe, and Southeast Asia, primarily due to its landlocked position. However, Central Asian countries have a significant potential for expanding trade within the region and developing infrastructure and industrial cooperation are priorities for economic growth. Despite this, trade in Central Asia remains imbalanced and has room for improvement, with Kazakhstan accounting for almost 81% of the total volume of trade. According to 2021

²¹⁸ International Monetary Fund (2022). Regional Economic Outlook: Middle East and Central Asia: Mounting Challenges, Decisive Times.

²¹⁹ ibid

²²⁰ International Organization for Migration (2022). World Migration Report 2022, URL: <https://publications.iom.int/books/world-migration-report-2022>

²²¹ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²²² According to the data from the World Bank database, URL: <https://data.worldbank.org/indicator/BN.GSR.GNFS.CD>

data, the share of intra-Central Asia trade in the foreign trade volume does not exceed 10% of the region's total turnover.²²³

Foreign investments represent an important development tool for the region. As of 2021, the volume of foreign direct investments accumulated by Kazakhstan, Tajikistan, Kyrgyzstan, Uzbekistan and Turkmenistan was equal to US\$211 billion. However, Kazakhstan accounts for 70% of the said volume, while oil and gas extraction remain the key sector for foreign investments.²²⁴

Extraction of mineral resources, heavy industry and services are the largest sectors in all four countries. Value added of the manufacturing industry is low, ranging from 13% (Kazakhstan) to 19.6% (Uzbekistan) across the countries of the region.²²⁵ Meanwhile, the value added of services is equal to 30-50% of GDP in the countries of the region. Moreover, Central Asian countries are gradually moving away from mainly agricultural specialization of Soviet times, especially in Kazakhstan and Kyrgyzstan. Agriculture does not have such economic importance anymore as previously, although it remains a significant source of livelihoods for mainly rural population in Central Asia. Ultimately, the value added of agricultural sector in these countries (except for Kazakhstan) was equal on average to 25-30% of GDP in 2000.²²⁶

The economies of Central Asian have demonstrated their resilience to global geopolitical crises. The region is expected to experience one of the highest economic growth rates in the next two years, estimated at 4.3%.²²⁷ However, the COVID-19 pandemic negatively impacted macroeconomic stability, resulting in a decrease in the exchange prices for raw materials, a decline in the flow of remittances, and increased debt burden and pressure on national currencies due to social and economic support expenditures.²²⁸ Central Asia spent almost 2% of GDP for social protection measures in response to the pandemic.²²⁹ In this context, opportunities for structural maneuvering and domestic public investments in higher education, science and technologies remain limited.

Central Asia faces several structural challenges that hinder the development of its economy. These include inadequate infrastructure, especially transportation and energy infrastructure, low technological saturation and relatively low labor productivity. Foreign investments, mostly in the form of credits, have been instrumental in financing infrastructure projects in the region. These projects, primarily funded by the World Bank, European Bank for Reconstruction and Development, and the Chinese initiative "One Belt - One Road," include large highways, railways, pipelines, and hydropower plants.

²²³ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²²⁴ *ibid*

²²⁵ According to the data from the World Bank database. URL:

<https://data.worldbank.org/indicator/NV.IND.MANF.ZS?locations=1W>

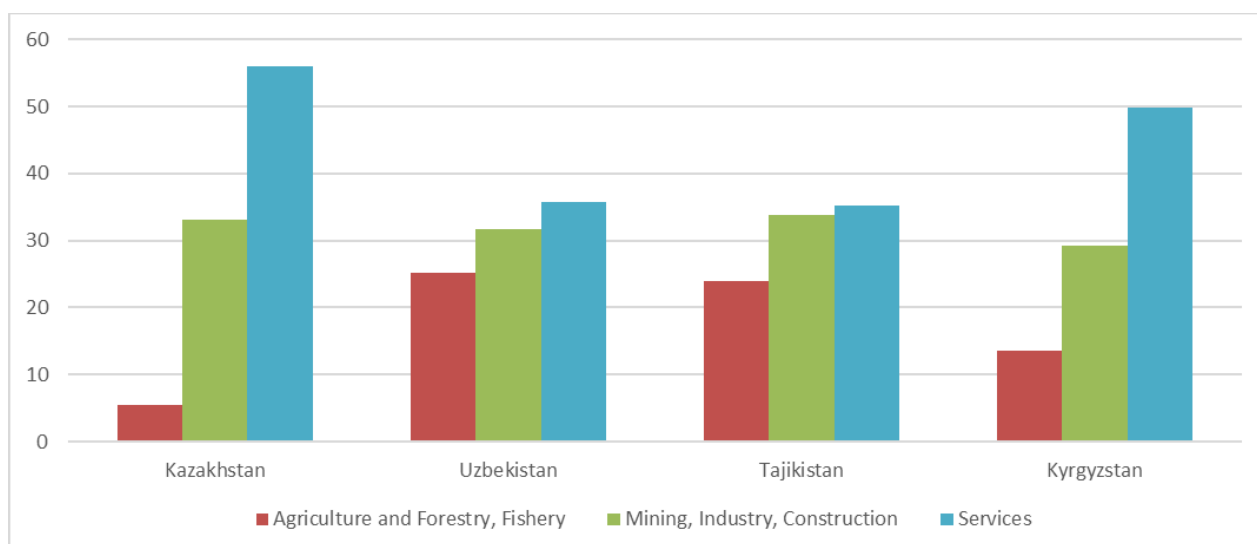
²²⁶ *Ibid*.

²²⁷ EBRD (2022). A Cold Winter Ahead? Confronting the energy crunch. URL: <https://www.ebrd.com/regional-economic-prospects-overview-september-2022.pdf>

²²⁸ COVID-19 crisis response in Central Asia. OECD 2020 https://read.oecd-ilibrary.org/view/?ref=129_129634-ujyjsqu30i&title=COVID-19-crisis-response-in-central-asia

²²⁹ *ibid*

Figure B.2. Value added by the economy sectors, % of GDP (2020)



Source: World Bank database.

The region, except for Kazakhstan, has low throughput capacity of communication and network infrastructure. Despite high Internet penetration, its throughput capacity remains low, and broadband Internet is expensive in Uzbekistan, Kyrgyzstan and, especially, Tajikistan (see Table B.1.).

Table B.1. Internet Accessibility in Central Asian countries (2022)

	Internet (downloading) speed (Mbps)	Cost of broadband Internet connection (% of median income)	Cost of 1 Gb of mobile Internet (US\$)	Share of Internet users among population (%) ²³⁰
Kazakhstan	2.4	1.5	0.8	85.9
Uzbekistan	1.8	7.7	1.3	71.1
Kyrgyzstan	2.5	9.5	0.6	72
Tajikistan	0.5	28.5	3.5	-

Source: Internet Accessibility Index. <https://www.broadbandchoices.co.uk/features/internet-accessibility-index>

ICT use index that considers Internet coverage and use is equal to 1.5 in Tajikistan, 4.6 in Uzbekistan and 4.7 in Kyrgyzstan. Global median value (5.3) is exceeded by Kazakhstan only.²³¹ The share of people that use Internet in Kyrgyzstan and Tajikistan is by 1.5-2 times lower than global average.²³² Countries of the region are at the bottom of the global Internet speed ranking.²³³

The issue of poverty remains a significant challenge in the region. Almost two thirds of the population in Kyrgyzstan and Tajikistan live on less than US\$6.85 a day (at purchasing power parity). Although poverty level in Kazakhstan (14.3% in 2018) is lower, it is remains significantly higher than in developed countries.²³⁴

Orientation towards raw materials exports makes Central Asian countries less resilient to external economic shocks. The region's economic growth model builds on the exports of natural resources and labor force, which increase countries' vulnerability to external shocks. In the context of abundance of natural resources, manufactured products and services are under strong pressure, while the development of

²³⁰ The indicator *Individuals using the Internet (% of population)* World Bank Database was used. Data for 2020.

²³¹ World Bank. TCdata360. URL: <https://tcdata360.worldbank.org/>

²³² UN. (2020). E-Government Survey/ URL: <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020>

²³³ Worldwide broadband speed league 2022. URL: <https://www.cable.co.uk/broadband/speed/worldwide-speed-league/>

²³⁴ According to data from the World Bank. URL: <https://data.worldbank.org/topic/11>

economic sectors that do not rely on resource extraction can be hindered. A large share of employment in Central Asian countries is concentrated in sectors with low productivity. Meanwhile, extraction of natural resources and hydrocarbons is capital intensive and does not require a large number of employees and cannot provide highly productive employment at a scale required for stable economic growth.²³⁵ Moreover, the resource-orientation of economies in the region limits regional cooperation, as Central Asian countries target foreign markets and commodities, which limits the diversification of their economies and the complementarity of their commodity composition.²³⁶

Central Asian countries continue to have a high proportion of the public sector and state-owned enterprises.²³⁷ Kazakhstan and Kyrgyzstan have made some progress in implementing market reforms, while Uzbekistan has undertaken substantial reforms in this direction by planning to privatize large state-owned monopolies. Governments in the region are making efforts to eliminate structural imbalances and move toward a more diversified market economy. In order to create a favorable investment climate, since 2017 Kyrgyzstan and Uzbekistan have been taking active measures to fight corruption in public administration.²³⁸ Tajikistan also facilitates the emergence of small businesses by facilitating access of entrepreneurs to financing, especially for returning migrants, as well as promoting exports in the agro-industrial sector. Nevertheless, opportunities for private initiatives and attracting private investments, including foreign investments, are still not optimal.

Except for Kazakhstan, countries in the region have had low rankings in *Ease of doing business* index. Several actors (mainly state-owned enterprises) dominate in key commodity markets, while the private sector is still limited. The density of new business registration per 1,000 people is relatively low and lags behind global averages (3.5; 2020) or Central European and Baltic states (3.7; 2020). The situation is better in Kazakhstan (3.5; 2020) and Uzbekistan (2.7; 2020), but in Kyrgyzstan (1.3; 2016) and in Tajikistan (0.2; 2018) it is far from optimal.²³⁹ Small and medium enterprises usually operate on the sidelines of informal economy. For example, in Kazakhstan, only 5% of small and medium enterprises are exporters, while in the upper-middle income countries every fifth business is exporting. Innovative activity of small and medium enterprises remains low, although it improved over the last years.²⁴⁰

New challenges force Central Asia to look for the new sources of economic growth. The region is facing declining labor productivity, decreases in remittances, risks from concentration of exports, and reliance on commodity prices. In the long-term, countries have largely exhausted opportunities of catchup development, while growth rates decline.²⁴¹ Currently, GDP per capita at purchasing power parity in the countries of the region (except for Kazakhstan) is several times lower than in the countries of Central Europe and Baltic states, and than global averages (see Figure B.3.). When comparing to developed countries, GDP per capita in Kazakhstan is two times lower, while the gap between other Central Asian countries and the most developed countries is from 7 to 14 times. Nevertheless, the gap has been narrowing over the last 20 years.²⁴² Economic recovery growth phase that followed economic downturn in 1990s is ending, with economic growth approaching the limits of extractive industries combined incomplete economic reforms and insufficient inclusiveness of political and economic institutions. Without new, technologically intensive, non-resource-based drivers of development, it will be difficult for the region to sustain economic growth.

In order to ensure a more sustainable development, it is imperative for Central Asian countries to prioritize the diversification of their economies and focus on science-driven production. To reduce the

²³⁵ OECD. (2018). Enhancing Competitiveness in Central Asia. URL: <https://www.oecd-ilibrary.org/development/9789264290129-ru>

²³⁶ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²³⁷ Izvorski, Ivailo V.; Mbowe, Appolenia; Dubashov, Bakyt; Gassner, Katharina B.; Ferrantino, Michael Joseph; Islam, Roumeen; Sahovic, Tarik; Kumar, Praveen. Kyrgyz Republic - Country Economic Memorandum: Main Report (English). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/679681585289928309/Main-Report>

²³⁸ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing

²³⁹ World Bank database. New business density (new registrations per 1,000 people ages 15-64), URL: <https://data.worldbank.org/indicator/IC.BUS.NDNS.ZS>. Data

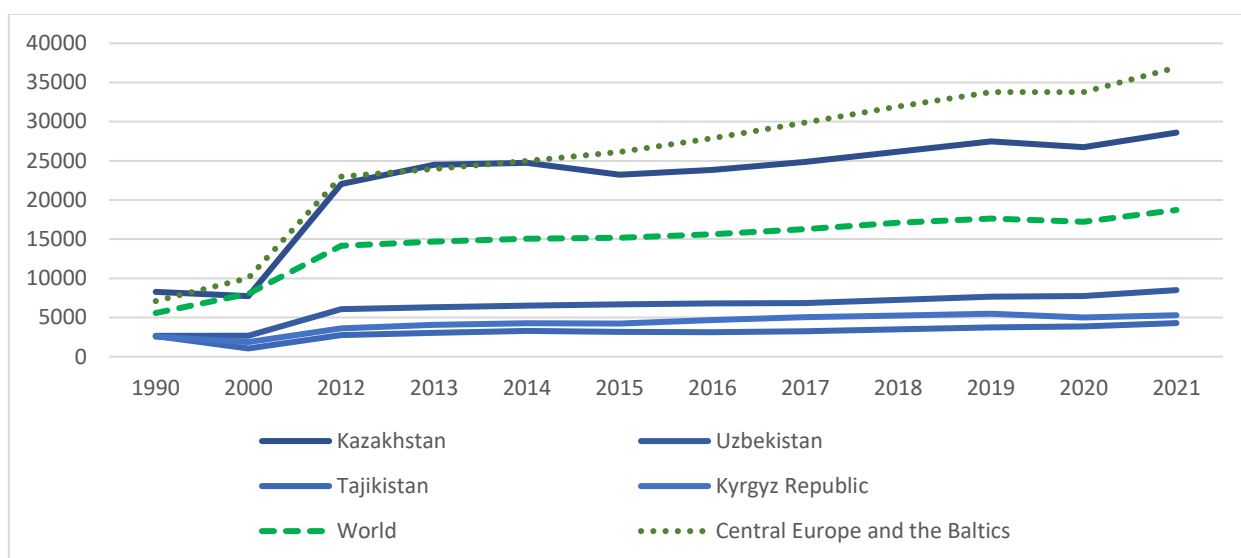
²⁴⁰ Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing

²⁴¹ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²⁴² *ibid*

risks of an economic growth model heavily reliant on exports of raw materials structural reforms are necessary: this would include the diversification of production, expansion of commodity composition and geography of exports, as well as increase in technological effectiveness. This will facilitate the development of private businesses, regional cooperation, exports of goods with high value added, and creation of highly productive jobs. However, this will also require adaptation of the higher education and science sector to the objectives of new economic sectors. For Central Asian countries to transition from a raw-material dependent economy to a competitive knowledge economy, they must develop a highly qualified workforce with an entrepreneurial spirit to increase the competitiveness of the economy and become a catalyst of modernization. Central Asian countries are taking steps towards achieving these objectives. In particular, Kazakhstan has set the objective to enter the top 30 most developed countries worldwide by 2050, Uzbekistan has been actively implementing large-scale reforms aiming at strengthening the manufacturing industries over the past five years²⁴³, with the aim of becoming an upper-middle income country by 2030.

Figure B.3. GDP per capita at purchasing power parity (1990-2021)



Source: World Bank database. URL: <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

On average, the manufacturing sector in Central Asia is not sufficiently innovative and science driven. In economic complexity rankings, Central Asian countries are significantly lagging behind even the lower-middle income countries.²⁴⁴ It means that the region lacks diversity in production know-hows, especially complex and specialized ones, which limits their ability to produce a wide range of complex goods. The lack of innovation in production of goods and services, and the insufficient inclusion of knowledge and technologies in their export base, has resulted in limited growth and decreased positions in international rankings.

One of the reasons for the lack of innovation in the manufacturing sector is the state's dominance in the economy and the insufficient level of market competition. Companies are reluctant to invest in innovations because of the high costs of introducing new technologies and promoting new products. Instead, they focus on gradual improvement of existing products and production lines. Manufacturing sector in Kazakhstan remains the most science-driven sector in the region, where almost one third of exports of goods of the manufacturing industry are high technology products.²⁴⁵ Their share in Kyrgyzstan is almost 13% (2021), and about 1% in Tajikistan and Uzbekistan (2020). Thus, Central Asia is overall characterized by a low level of technological saturation of the economy and research intensity of production, and the region's imports of high-technology products significantly outweigh its exports.

The limited transfer of technology in the region can be attributed to the low entrepreneurial culture. Central Asian countries are not among the leading countries in terms of the development of entrepreneurial

²⁴³ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²⁴⁴ Observatory for Economic Complexity, 2020. Country Rankings (ECI). URL: <https://oec.world/en/rankings/eci/hs6/hs96>

²⁴⁵ World Bank database. High-technology exports (% of manufactured exports). URL: <https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS>

culture and climate,²⁴⁶ although the number of companies that use innovations, as well as the risk tolerance of the national market participants have increased. In addition, weak protection of intellectual property and law enforcement practice may discourage companies and investors from participating in the technology transfer in Central Asia. This may also limit opportunities of researchers and entrepreneurs to commercialize their inventions and innovations.

Developing a green economy in Central Asia will require to reduce reliance on fossil fuels. Two decades of fast economic growth resulted in growing demand for electricity in Central Asia, resulting in increased carbon dioxide emissions. For example, more than 70% of electricity in Kazakhstan comes from aging coal power plants, while production of heat and electricity account for about 80% of carbon dioxide emissions, which have substantially increased since 2006.²⁴⁷ Altogether, the region remains one of the most carbon intensive globally with some cities of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan in the list of the top 100 most polluted cities.²⁴⁸ At the same time, Central Asian is highly vulnerable to climate change, especially when it comes to water resources, energy and food security. Expected climate change impacts include higher maximum monthly temperatures, high variability of precipitation across different agroecological and climate zones, increased melting of glaciers affecting water supply and river runoff, as well as earthquake risks. These environmental problems will negatively impact the quality of life, development of agriculture, investment and tourist attractiveness of the region.

Central Asian countries have recognized these problems and are taking action. Recently Kazakhstan, Tajikistan and Uzbekistan have announced initiatives to reduce carbon dioxide emissions, and ultimately achieve carbon neutrality.²⁴⁹ They have prioritized increasing the sustainability of development and eliminating climate change vulnerability in their national strategic documents. The agenda includes developing resource saving technologies, modernizing melioration systems and agricultural technologies, reducing desertification risks, improving forest rehabilitation, as well as disseminating low-carbon technologies.²⁵⁰ As early as in 2013, Kazakhstan became the first CIS country to adopt a Concept for Green Economy Transition. Kazakhstan plans to achieve carbon neutrality by 2060 and is the first country in Central Asia that has introduced an emission quota trading scheme.²⁵¹ Uzbekistan has declared its commitment to achieving Sustainable Development Goals by 2030, including those related to climate change and resilience of cities. The country has adopted a Strategy for Transition to the Green Economy for 2019-2030 and has embarked on a number of reforms to modernize and diversify agriculture, as well as to increase investments in renewable energy. In 2018 Kyrgyzstan has adopted a Green Economy Concept as well.²⁵²

The imbalance of water resources in Central Asia is a prominent problem. Kyrgyzstan and Tajikistan, despite having abundant water resources, face an energy deficit. These countries are located upstream of the region's largest rivers and account for 75% of all water resources in Central Asia. However, they have limited arable lands and almost no reserves of hydrocarbons. In contrast, Kazakhstan and Uzbekistan, located downstream, both have surplus of electricity and shortages of water resources, while having abundant reserves of hydrocarbons. Moreover, renewable energy, particularly hydropower, holds immense potential in the region, given that almost one-fifth of its territory is mountainous. The use of water resources is one of the areas where countries have accumulated research capacity, and where cooperation would provide common benefits.

Over the last decade, Central Asian countries have progressively enhanced their human capital.²⁵³ Kazakhstan is one of the global leaders based on the Human Capital Index, Uzbekistan is among the

²⁴⁶ World Economic Forum. (2019). The Global Competitiveness Report. URL: <https://bit.ly/3L4BQ5M>

²⁴⁷ EBRD (2022). A Cold Winter Ahead? Confronting the energy crunch. URL: <https://www.ebrd.com/regional-economic-prospects-overview-september-2022.pdf>

²⁴⁸ World Air Quality Report (2021), URL: <https://www.iqair.com/world-most-polluted-cities/world-air-quality-report-2021-en.pdf>

World Air Quality Index (2023), URL: <https://www.iqair.com/world-air-quality-ranking>

²⁴⁹ World Bank (2022). Social Protection for Recovery.

²⁵⁰ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²⁵¹ World Bank, URL: <https://www.worldbank.org/en/news/opinion/2021/07/01/envisioning-central-asia-s-green-recovery>

²⁵² Lewis, J., Schneegans, S., & Straza, T. (2021). UNESCO Science Report: The race against time for smarter development (Vol. 2021). UNESCO Publishing

²⁵³ Measured using Human Development Index

countries with high level of development, while Kyrgyzstan has an average score.²⁵⁴ In Central Asia, school life expectancy is one of the highest in the world, but tertiary education enrollment rates are below those of high-income countries. The demand for highly qualified specialists is rising in the region, as reflected in the relatively low unemployment rates (1.5% to 5.9%) among highly educated professionals, compared to 13.2% in lower-middle-income countries.²⁵⁵ However, the penetration of soft skills is worse than could be expected given such developed system of general education.²⁵⁶ Moreover, some parts of the workforce in Central Asia lack the skills to adapt to rapid technological changes, indicating a need to improve the development of modern skills.²⁵⁷

It is necessary to increase effectiveness of the use of already available human capital. Human capital in Central Asia has a low contribution to economic productivity, especially when compared to European countries.²⁵⁸ Despite having an educated population, labor productivity in Central Asia remains low. For example, the productivity levels of agricultural exporters in the region are only 3-14% of those in the most developed countries.²⁵⁹ Even in Kazakhstan, traditionally the regional leader in this regard, productivity has been declining.²⁶⁰ Moreover, intersectoral labor mobility alone cannot drive productivity growth, and significant efforts are required to increase effectiveness within the sectors and introduce technological innovations.²⁶¹ Creating new, highly productive jobs is also crucial, and the digitalization of public sectors could significantly enhance efficiency despite the resource constraints.

The problem of youth unemployment persists in the Central Asian countries. The unemployment rate of 15-24-year-olds in the region reaches 16-19%, which is comparable to that of lower-middle-income countries and represents a significant challenge for growth. The situation is different in Kazakhstan, where this figure is 3.7%. The weak development of the private sector does not create enough jobs to match the population growth rate amid the demographic boom. This demographic pressure will increasingly stimulate labor migration. In some countries of the region, a significant share of young people is not in education or employment. The NEET²⁶² value is about 19% for Kyrgyzstan (2020) and 24% for Uzbekistan (2021).²⁶³

Central Asia is experiencing significant growth in non-standard forms of employment.²⁶⁴ Such forms of employment are usually related to circumstances that limit the opportunities for traditional employment, for example, in relation to education, starting a career, responsibilities related to care for family members, etc. In Central Asia, more than one third of employed population has non-standard employment, which is higher than in many other regions of the world (in comparison, this figure is 12.3% in Central European and Baltic states).²⁶⁵

The higher education sector in Central Asia faces significant challenges due to population growth. Between 2000 and 2021, the population of Central Asia has increased by 1.4 times, and the region is expected to experience an average annual demographic growth rate of 1.1% until 2040. These demographic dynamics will favor the emergence of a large workforce in the coming years.²⁶⁶ However, these trends will increase the pressure on higher education systems in the coming five years, leading to more selectivity and

²⁵⁴ World Bank. Human Development Index, URL: <https://data.worldbank.org/indicator/HD.HCI.OVRL>

²⁵⁵ Share of unemployed that have education of at least ISCED5 level, in the total number of labor force with such level of education (Unemployment with advanced education (% of total labor force with advanced education). World Bank database. 2020 and 2018, URL: <https://data.worldbank.org/indicator/SL.UEM.ADVN.ZS>

²⁵⁶ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

²⁵⁷ Flabbi, L., & Gatti, R. (2018). A primer on human capital. World Bank Policy Research Working Paper, (8309).

²⁵⁸ Demirgüç-Kunt, A., & Torre, I. (2020). Measuring Human Capital in Europe and Central Asia. World Bank Policy Research Working Paper, (9458).

²⁵⁹ World Bank (2020). Global Productivity: Trends, Drivers, and Policies.

²⁶⁰ World Bank (2019). Kazakhstan Reversing Productivity Stagnation: Country Economic Memorandum. World Bank

²⁶¹ *ibid*

²⁶² World Bank, NEET – share of youth not in education, employment or training, total as % of youth population 16-24, URL <https://data.worldbank.org/indicator/SL.UEM.NEET.ZS> Note: share of 16-24-year-old youth not in education, professional training or employment.

²⁶³ World Bank (2021), Youth Employment in Uzbekistan: Opportunities and Challenges, based on the Household Budget Survey conducted by the State Committee of the Republic of Uzbekistan on Statistics.

²⁶⁴ Nonstandard forms of employment. These forms of employment differ from the two most common forms of employment - full-time permanent paid (“standard”) employment and self-employment. They include part-time employment, employment under temporary contracts, agency work, and hired labor without a legal contract.

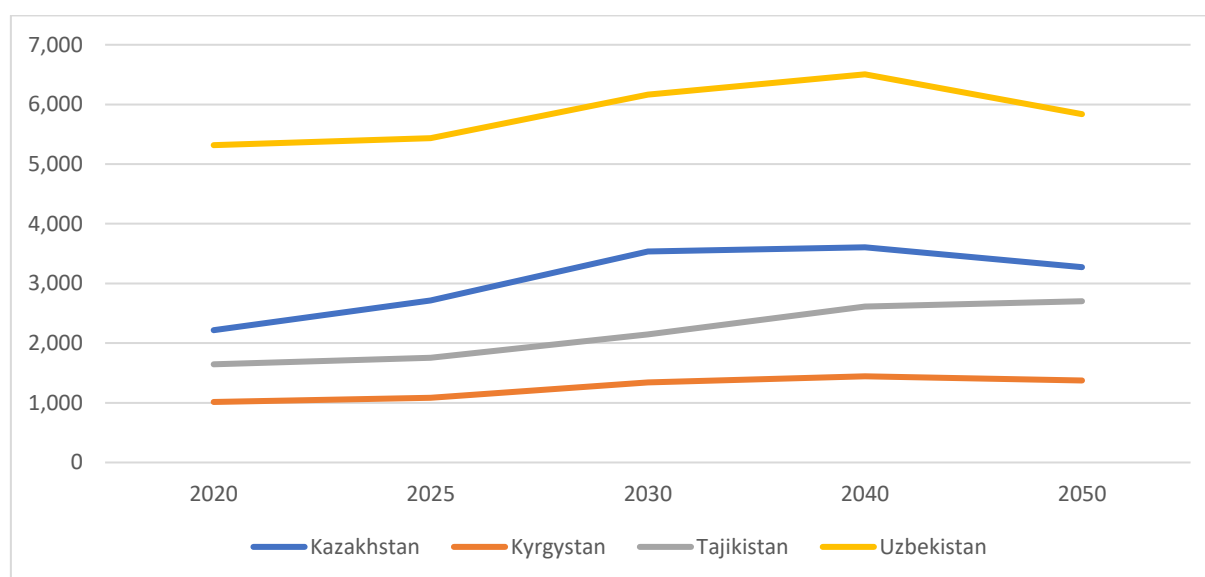
²⁶⁵ World Bank (2022) Social Protection for Recovery.

²⁶⁶ Eurasian Development Bank. (2022). The Economy of Central Asia: A Fresh Perspective. URL: https://eabr.org/upload/iblock/d0b/EDB_2022_Report-3_The-Economy-of-CA_rus.pdf

even more limited accessibility. Specifically, the share of 15–24-year-old cohort, which is relevant for higher education systems, will increase in the Central Asian countries until 2030, while in some countries this trend will continue even beyond 2030. The size of this cohort in Kazakhstan will increase by 60% until 2030 (as compared to 2020), while in Kyrgyzstan and Tajikistan, by more than 30% (see Figure B.4.). At the same time, Central Asian countries are experiencing less population aging than many other countries with higher national income. The demographic pressure coefficient²⁶⁷ in the countries of the region is 5.6%-13%, which is lower than global averages, and by several times less than in Central European and Baltic states.²⁶⁸

Emigration is a critical challenge for human capital in the region. All countries under consideration have negative net migration.²⁶⁹ Over the last thirty years, migration flows have consistently decreased in Central Asia, except for Kazakhstan. This is especially relevant for Kyrgyzstan and Tajikistan, where it has decreased by 3 and 1.5 times, respectively. However, at the same time, Central Asia has been experiencing a significant increase in migration inflows, making it comparable to Europe in absolute terms.²⁷⁰ The problem of emigration of the highly qualified professionals is especially acute.

Figure B.4. 15-24-year-old population cohort forecast, million (2020-2050)



Source: World Population Prospects (2019). URL: https://www.ined.fr/fichier/s_rubrique/29368/wpp2019_10.key.findings_embargoed.version.en.pdf

Russia remains the key destination for outbound labor mobility from Central Asian countries. More than 2.5 million citizens of Kazakhstan, 1.15 million citizens of Uzbekistan, 0.59 million citizens of Kyrgyzstan, and 0.46 million of citizens of Tajikistan have emigrated to Russia.²⁷¹ Many of these workers were forced to leave their countries due to high levels of unemployment and search for higher pay and better working conditions in Russia, except for Kazakhstan to some extent. Males make up a significant portion of outbound labor mobility from Central Asia. Russia also remains the key source of inbound migration for the countries of the region (see Table B.2, Figure B.5.). Labor migration has helped some countries in the region to reduce the level of unemployment through the export of surplus labor and leverage the benefits of incoming remittances. However, its large scale and format have depleted the pool of economically active individuals and frequently led to the separation of families.

²⁶⁷ World Bank, URL: <https://data.worldbank.org/indicator/SP.POP.DPND>

²⁶⁸ ibid

²⁶⁹ World Bank, Net migration, URL: <https://data.worldbank.org/indicator/SM.POP.NETM>

²⁷⁰ International Organization for Migration (2022). World Migration Report 2022, URL: <https://publications.iom.int/books/world-migration-report-2022>

²⁷¹ According to the data from UN, Department of economic and social affairs, 2020 URL: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesapd_2020_international_migration_highlights.pdf

Table B.2. Inbound migration according to the mid-year data, by origin (2020)

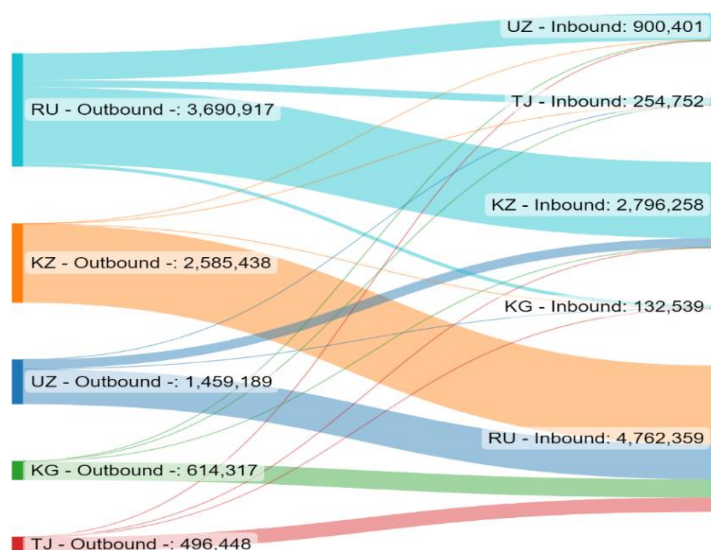
	Total	Central Asia	Russia	Other regions
Uzbekistan	1,162,007	30,112	871,047	260,848
		2.6%	75.0%	22.4%
Tajikistan	276,031	20,200	234,998	20,833
		7.3%	85.1%	7.5%
Kyrgyzstan	199,011	24,658	108,854	65,499
	100%	12.4%	54.7%	32.9%
Kazakhstan	3,732,073	321,344	2,476,018	934,711
	100%	8.6%	66.3%	25.0%

Source: UN, Department of economic and social affairs. URL:

https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2020_international_migration_highlights.pdf

Migration mobility within the region remains limited. The share of migrants from the Central Asia within the region is less than 10% of the total share of migrants (slightly more in Kyrgyzstan). In the context of economic growth in Kazakhstan supported by oil prices, this country emerged as a hub for inbound migration within the region, receiving four times more migrants from Central Asia than all other countries combined (see Figure B.5.). At the same time, Central Asia has demonstrated the capacity to enhance labor and educational mobility within the region. Transportation infrastructure has been rapidly expanding, with the length of railways and hard-surfaced roads increasing at an accelerated pace. Additionally, new airports, transportation and logistics centers, and border crossing points have been constructed, further supporting mobility within the region.

Figure B.5. Structure of migration flows in Central Asian countries (2020)



Source: UN, Department of economic and social affairs. URL:

https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2020_international_migration_highlights.pdf

C. Overview of national higher education policies in Central Asia

Kazakhstan

Kazakhstan has become a pioneer in implementing structural reforms in line with the Bologna principles. The reforms include the introducing three levels of higher education (bachelor's, master's, and postgraduate programs), the implementation of the credit-modular system based on ECTS, and the gradual transition to

decentralization and autonomy in higher education.²⁷² The number of HEIs has increased from 55 public institutions in 1990 to 122 in 2022, and the number of students has doubled from 287,000 in 1990 to 575,000 in 2021 (see Table 1.1.). Currently, the majority of HEIs are non-state, while the lion's share of public funding for higher education comes from private sources, and especially from tuition fees paid by students. This rapid expansion of the higher education system was not accompanied by a corresponding increase in funding and negatively impacting the quality of education.

Several initiatives have implemented to address this issue. In 2004, a centralized admission to HEIs was introduced through the Unified National Testing (UNT). Kazakhstan has also introduced voucher public financing has emerged, including schemes for the distribution of scholarships based on students' potential and needs, which led to increased competition between HEIs for students and, therefore, improved education quality. In 2012, a centralized comprehensive testing has been additionally introduced for college graduates (secondary vocational education) in order to improve the selectivity of admission at HEIs.

Although universally state educational standards, that regulate education, qualification requirements for HEIs, and classifier of fields of study, are still effective, Kazakhstan is gradually granting more academic and administrative autonomy to HEIs. Since 2018, HEIs, regardless of their form of ownership, are allowed to develop their own academic programs, to establish teaching load and salaries for university staff, as well as to develop qualification requirements for faculty members. At the same time, the country has completely moved to voucher-based financing of bachelor's programs. HEIs are expected to adopt their own admission rules with further liberalization of higher education.

In 2022, the Ministry of Science and Higher Education was separated from the Ministry of (Secondary) Education, a move expected to deepen and strengthen Kazakhstan's reform path in response to challenges the country is facing. One such challenge is the increasing demographic pressure that could affect accessibility due to the potential increase in demand for higher education. To ensure accessibility and affordability, the government would need to increase funding for higher education. Some efforts have already been made, including a consistent increase in the number of scholarships financed by the state, which has grown from 12,860 places in 2000 to 88,204 places in 2022, accounting for the majority of public funding for higher education. Currently, a reform to differentiate scholarships based on the results of student admission tests is being considered. Scholarships would cover 30% to 100% of tuition fees, depending on the admission test results. In order to increase accessibility of higher education, the recognition of short-term education is also considered, such as micro-credentials, accumulated degrees, various forms of online education and trainings, including informal education.

Improving the quality of scientific research and their importance for the economy and policy of Kazakhstan is yet another priority for the country. Centers of excellence will be established at 20 universities; it is planned to open branches of foreign science-driven institutes in Kazakhstan in order to enhance transfer of knowledge and technology.

Kyrgyzstan

Before to its independence, there were 10 public universities in Kyrgyzstan, with a total of 55,000 students, nine of which were located in Bishkek. Since 1991, there has been a rapid increase in the number of universities in the country, and currently there are 73 universities, of which 40 are private. The number of students has also increased significantly and reached 235,000 in the 2021-2022 academic year, of which 84% study at public universities. At the same time, the share of public funding at public HEIs amounts to less than 15%, meaning that the majority of students, even at public universities, are required to pay for their education, and that the budget of a HEI is largely dependent on contract-based students. The government provides 5,700 scholarships annually (starting from 2022-2023 academic year, 6,000 scholarships) to applicants who received the highest scores after taking the National Test for university administration (NST/ORT). Scholarships are distributed across universities based on the needs of the national economy, often with a focus on pedagogical departments due to a shortage of teachers.²⁷³ The higher education system is managed mainly by the Ministry of Education and Science. However, there exist also some HEIs that additionally report to certain agencies, such as the Academy of Public Administration under the President of the Kyrgyz Republic, the Academy of MIA that is reporting to the Ministry of

²⁷² Kemelbayeva, S. (2020). Access and returns to education in Kazakhstan (Doctoral dissertation, Newcastle University).

²⁷³ According to the Vice-Minister of Education, in 2020 the country's secondary education system faced a deficit of up to 2,000 teachers, URL: <https://for.kg/news-682280-en.html>

Internal Affairs, the Kyrgyz State Medical Academy (Ministry of Health) or the Diplomatic Academy (Ministry of Foreign Affairs).

In 2013, the Law on Education was amended, introducing important new instruments for the Kyrgyz higher education system: a) establishing an independent accreditation agency; b) principles for the recognition of independent accreditation agencies; c) procedures for institutional accreditation; and d) procedures for program accreditation. These changes enabled the country to move away from the centralized licensing system that was controlled by the Ministry of Education and provided more autonomy to colleges and universities of Kyrgyzstan. In 2014, the Ministry of Education and Science established the National Accreditation Council, which supervises the accreditation agencies, selects and authorizes accreditation agencies responsible for the accreditation of educational services of educational institutions and programs. In 2016, HEIs were allowed to select an independent or international accreditation agency for the quality assessment of educational services.

In 2019 new provisions were included in the Law on Education, which stipulated that training of specialists at all levels should rely on the National Qualifications Framework. The National Qualifications Framework was approved in 2020 and establishes a unified scale of qualifications levels, sectoral framework of qualifications, and professional standards. This system ensures compatibility across sectors of qualifications and serves as a basis for validating and awarding qualifications of specialists.

In 2013, the implementation of pilot Ph.D. programs started in seven HEIs of the country in line with Bologna process, while in 2020 the Government approved the adoption of the Doctor of Philosophy (Ph.D.) degree in HEIs of the country.

In July 2022, the Decree of the President assigned a special status to five HEIs of the country, providing for greater academic, financial, and administrative autonomy. These institutions can now receive revenues from educational, advisory, research and other commercial activities, as well as to establish their own remuneration standards for university staff. This system aims to develop advanced research capabilities, promote collaboration between universities, and support joint commercial ventures with industrial enterprises.

At the beginning of the 2022-2023 academic year, Kyrgyzstan launched a new project to support innovative student. This project provides funding for the development of business incubators and startup centers at 32 HEIs across the country. Startup projects selected through a competitive process will receive grants of up to 100 million KGS to implement their initiatives.²⁷⁴

Tajikistan

The higher education sector in Tajikistan has undergone significant changes in recent years, driven by the country's industrialization and the need to train skilled professionals. Since 1991-1992, the number of HEIs has increased from 13 to 41, with a corresponding increase in public funding. Private sector growth has been limited, however, and public funding has largely driven this expansion. In 2000, the total public financing for the education sector was 41 million TJS, but by 2014, it had increased to 2.5 billion TJS, and in 2021, it reached 5.5 billion TJS.

To support internationalization efforts, the implementation of the ECTS system began in Tajikistan in 2004 and the country made efforts to align its higher education system with international standards. In 2011, Tajikistan signed the European Council's Convention on recognition of higher education in Europe, which allowed for the recognition of diplomas from third countries. In 2008, the establishment of the National Testing Center improved access to education and enabled the organization of the national assessment system. This center supports the centralized university entrance examinations in secondary and higher vocational institutions of the country. In order to develop continuous education and opportunities for receiving a second education, Tajikistan introduced distance education in 2015, and by the 2017-2018 academic year all HEIs have moved from extramural education to distance education.

With the support provided by international partners, the process of accrediting institutions based on the European Standards and Guidelines (ESG) principles has been considered in 2021. In parallel to this process, Tajikistan's Ministry of Education and Science has developed new generation educational programs that are based on modular system and outcome-based education.

²⁷⁴ AKIpress (2022). URL: <https://bilim.akipress.org/ru/news:1811459/?f=cp>

Since 2016, Tajikistan is monitoring the outcomes of graduates of HEIs. Along with the results of employer market analysis, graduate monitoring systems will become a basis for ongoing curriculum development and improvement, in response to the lack of alignment of curricula and skills of graduates with the needs of the labor market and inflexible quota system for places in HEIs based on specializations. There is a shortage of engineering and technical specialists for industrial enterprises or professional and experience managers for small and medium business sector. To address these challenges, the period of 2020-2040 was declared to be “Twenty Years of the Study and Development of Natural, Exact and Mathematical Sciences in the Field of Science and Education”.

Other important reforms are required for Tajikistan’s higher education system, including enhancing human resources, the development of a quality assurance system, the establishment of a national qualification system and its alignment with international standards, increasing the internationalization of the sector and as well as its international competitiveness. A number of projects have been outlined in the "National Strategy for the Education Development in the Republic of Tajikistan until 2030" to achieve these objectives, including enhancing the international integration of the higher education system, ensuring the quality of education, and improving the qualifications of scientific and faculty members. Additional steps for internationalization of education are provided in the “State program for improving teaching and learning of Russian and English languages in the Republic of Tajikistan until 2030” that aimed to train specialists proficient in both Russian and English languages.

Uzbekistan

In recent years, the higher education sector in Uzbekistan has experienced rapid and deep changes. First, the number of HEIs has increased from 70 at the beginning of the 2016-2017 academic year to 194 in the 2022-2023 academic year (see Table 1.1.) and the Government of Uzbekistan increases admission quotas every year. From 2016 to 2022, the number of students has almost quadrupled, while gross enrollment in higher education has increased from 9% to 21%. In addition, Uzbekistan aims to increase total enrollment in higher education to 50% until 2030.

In parallel, several initiatives have been implemented to improve research capacity and HEI management. In 2017, the government reformed the system for awarding doctoral degrees in order to align with international standards and plans to gradually move 85% of Uzbek HEIs to a credit-modular system by 2030. Largely moving away from the previous centralized state policy, the government provides greater autonomy to the selected HEIs. Since 2022, 35 public HEIs have been able to independently manage their budgets, as well as to make decision on the number of admitted students and educational programs.

Despite these recent changes, efforts are still needed to develop the higher education sector. Although accessibility of higher education has improved in recent years, only 18% of applicants admitted to bachelor’s programs were able to receive a place for education in 2021-2022. The quality of higher education remains low, particularly in terms of faculty qualifications and research output. Currently, only 39% of professors hold doctoral or candidate degrees, and there is a lack of emphasis on research. Moreover, the management structure in the majority of HEIs also limits their ability to respond to the changing needs of the economy. As a result, skills of the scarce university graduates are not aligned with the requirements of the labor market, especially when it comes to soft skills, which ultimately negatively affect Uzbekistan's economic development objectives. Finally, although the Uzbek higher education sector has gradually become increasingly open and internationalized, cooperation with other Central Asian countries remains limited.

D. Alignment of Strategic Pillars with higher education priorities of Central Asian countries

Table D.1. Alignment of Roadmap Pillars with strategic priorities of Central Asian countries

	Kazakhstan	Uzbekistan	Tajikistan	Kyrgyzstan
Pillar 1.1. Ensuring external and internal quality assurance	<ul style="list-style-type: none"> - Level of satisfaction with the higher and postgraduate education system (composite index): 70 by 2025 - Share of HEIs managers that have completed continuous professional development programs in management: 100% by 2024 	<ul style="list-style-type: none"> - HEIs that adopted the credit-modular system: 85% by 2030 - Control over the education quality assurance processes through electronic education management system: 100% by 2025 	<ul style="list-style-type: none"> - Prepare HEIs to international accreditation, by 2023 (2) - Develop and introduce a new national system for higher education quality assurance, by 2023 (2) - Introduce a quality management system in HEIs, by 2023 (2) 	<ul style="list-style-type: none"> - Analysis of results of monitoring of accredited agencies and improvement of legal acts and regulations related to the quality assurance system in vocational education. Introducing a ranking system of HEIs by 2040. - A regulatory framework has been prepared for accreditation of Ph.D. programs by 2040
Pillar 1.2. Enhancing the effectiveness and the quality of teaching	<ul style="list-style-type: none"> - Share of implemented educational programs for teaching staff in universities, developed based on professional standards: 100% by 2022 	<ul style="list-style-type: none"> - Share of teaching staff who have improved their qualifications or completed an internship abroad: 20% by 2030 - Share of foreign teaching staff engaged HEIs (except for branches of foreign HEIs): 12% by 2030 - Availability of academic and research literature in the electronic format (relative to the total number of academic and research literature): 90% by 2030 - Implementation of education management information system for at HEIs: 100% by 2025 - HEIs with digital learning technologies, in particular the “E-MINBAR” electronic platform, online, webinar technologies: - 100% by 2030 	<ul style="list-style-type: none"> - Train teaching staff in modern teaching technologies, including distance learning, by 2023 (2) - Develop new mechanisms and requirements for competitive selection of university staff and development of talent pool, by 2023 (2) - Develop a program for improvement of qualifications and retraining of academic, teaching and administrative personnel, by 2023 (2) - Develop an electronic system for assessing the performance of faculty members, by 2023 (2) - Improve the qualifications of faculty members through continuous professional development programs, internships abroad, and project activities, by 2023 (2) 	<ul style="list-style-type: none"> - Average share of faculty members of HEIs that have completed continuous professional development programs in the previous year, in period of 2020-2040: 25%. - Standards /were developed and adopted to enable the recognition of learning outcomes of faculty members obtained through virtual mobility by 2040
Pillar 1.3. Widening participation and access to higher education	<ul style="list-style-type: none"> - Share of HEIs that have created conditions for inclusive education: 70% by 2025 - The number of commissioned beds in dormitories of VET institutions and HEIs: 90 thousand by 2025 	<ul style="list-style-type: none"> - Enrollment in higher education (in % relative to the number of school graduates): 50% by 2030 - The number of non-state HEIs, including under public-private partnerships: 35 by 2030 	<ul style="list-style-type: none"> - Prepare curricula, including for distance learning, of students with disabilities, by 2023 (2) 	-

			- Develop electronic curricula, provide HEIs with software and hardware for distance learning, by 2023 (2)	
Pillar 1.4. Ensuring the relevance of higher education	- Share of graduates employed in the first year after graduating a HEI based on state order: 75% by 2025	- Share of students enrolled in engineering and technical disciplines: 50% by 2030 - Bachelors' graduates admitted to master's programs: 22% by 2030 - Share of curricula incorporating practice-oriented projects in main fields of study: 80% by 2030	- Integrate the country group with high Human Development Index by 2030 (1) - Perform labor market analysis to increase the labor market participation of women in line with the needs of domestic and foreign labor markets, and priority development areas by 2023 (2) - Develop a National Qualifications Framework, by 2023 (2) - Strengthen cooperation between HEIs and employers through of the promotion of internships, joint projects and partnerships, as well as training specialists based on employers' needs, by 2023 (2)	- Average score of National Scholarship Test of applicants to pedagogy programs in HEIs: - 160 by 2040 - Percent of employment and retention of graduates of pedagogy programs that have studied at the expense of the budget: 78% by 2040
Pillar 2.1. Increasing research productivity of academic staff	- Increase in the number of Kazakh publications in top-rated journals in relation to the total number of publications, in 2018 (4873 pcs.), according to the data from information resources on the Web of Science (Clarivate Analytics) and Scopus (Elsevier) platforms: 88% by 2025	- Number of articles in journals indexed in "Scopus", "ScienceDirect", "Web of Science" and other international scientific and technical databases: 7000 by 2030 - Number of academic journals of HEIs, included in "Scopus", "ScienceDirect", "Web of Science" and other international scientific and technical databases; 45 by 2030 - Number of teaching staff in HEIs with Hirsch index (h-index) of 5 and above: 900 by 2030	- Revise the incentive system for scientific and research achievements and innovative projects in the higher education system, by 2023 (2) - Develop instruments for assessment the performance of research and teaching staff, by 2023 (2)	-
Pillar 2.2. Building research capacity and excellence in higher education institutions	- Share of expenditures on research as % of GDP (from all sources): 1% by 2025 - Share of expenditures on education and science as % of GDP (2019 - 3.8%): 7% by 2025 - Share of updated research equipment in public HEIs, research institutes, that perform R&D activities: 15% by 2025 - Increase in the number of researchers from the total number of researchers in 2018	- Share of teaching staff who have an academic degree: 90% by 2030 - Orientation of graduates of master's programs towards scientific research: 45% by 2030	- Total expenditures on science as % of GDP: 1.5% by 2030 - Share of individual employed in the R&D sector in the total workforce: 0.6- 0.65 % by 2030	- Development of a model of National scientific citation by 2040 - A legal act has been drafted for implementation of Ph.D. programs. - Participation of HEIs in national and international ranking 2030

	(17,454 people): 5.2% by 2025 - Increase in the number of junior researchers below 35 from the total number of researchers in 2018 (6,566 people): 9.6% by 2025 - Number of HEIs in the Top-200 rating of QS-WUR: 3 by 2025			
Pillar 2.3. Strengthening linkages between universities and industry	- Quality of research institutions to rank at least 63rd in the Global Competitiveness Report of the World Economic Forum by 2025 - Share of private spending in the total volume of R&D expenditures: 57.4% by 2025. - Share of commercialized research projects from the total number of completed applied research works: 30% by 2025		- Attract investments into research works, by 2023 (2)	- The <i>National HEI Science</i> Project has been developed and prepared for piloting - for redirecting the science towards applied research, and improving the quality of research activities and efficiency of deliverables by 2040
Pillar 3.1. Establishing regional cooperation infrastructure				-
Pillar 3.2. Harmonizing the higher education space		- Number of HEIs, established based on foreign educational programs: 45 by 2030	- Develop new curricula in line with international requirements and the Bologna principles by 2023 (2)	-
Pillar 3.3. Enhancing internationalization and intra-regional mobility	- Share of HEIs implementing joint educational programs, academic exchanges with foreign partners within the framework of internationalization strategy: 60% by 2025 - Share of foreign students: 10% by 2025	- Share of foreign students: 15% by 2030	- Strengthen cooperation with foreign universities for mobility programs by 2023 (2)	-
-	Document 1: State program for development of education and science in the Republic of Kazakhstan for 2020 - 2025, URL: https://www.gov.kz/memleket/entities/edu/press/article/details/20392?lang=ru	Document 1: Concept for the development of the higher education system in the Republic of Uzbekistan until 2030. URL: https://lex.uz/ru/docs/4545887#4549327	Document 1: National Development Strategy of the Republic of Tajikistan until 2030, URL: https://medt.tj/ru/strategiy-i-programmi/hcp-2030 Document 2: National Education Development Strategy of the Republic of Tajikistan until 2030, URL: http://portali-huquqi.tj/publicadliya/view_qonunhovview.php?showdetail=&asosi_id=23751	Document 1: Education Development Program of the Kyrgyz Republic for 2021-2040, URL: http://cbd.minjust.gov.kg/act/view/ru-ru/158227

E. Matching Strategic Pillars and higher education development challenges in Central Asia

Table E.1. What challenges are addressed by the actions and projects included in the Roadmap?

	Low selectivity and renewal of university staff	Lack of modern teaching skills	Wear and tear and lack of research and educational infrastructure	Weak external and internal quality assurance	Comparatively low enrollment rates in higher education	Social and territorial disparities in access to higher education	Weak links between universities and the industry	Outdated curriculum	Imbalance between the demand and supply of skills	Low quantity and quality of publications	Lack of advanced research centers and science schools	Low research staff saturation	Lack of research skills and academic culture	Low level of technology transfer	Low level of cooperation between universities and research institutes	Low level of internationalization and mobility within the region	Brain drain	Lack of harmonization of the educational space	
Pillar 1.1. Ensuring external and internal quality assurance in higher education																			
<i>Developing regional accreditation standards</i>																			
<i>Promoting effective internal quality assurance units and tools</i>																			
<i>Establishing the Central Asian Accreditation Agency</i>																			
<i>Developing sectoral higher education quality standards</i>																			
<i>Objective cross-country comparison of educational quality and learning outcomes</i>																			
Pillar 1.2. Enhancing the effectiveness and the quality of teaching																			

<i>Increasing the attractiveness and the effectiveness of the teaching profession</i>																		
<i>Developing an integrated labor market for academic staff</i>																		
<i>Developing modern teaching skills and methods</i>																		
Pillar 1.3. Widening participation and access to higher education																		
<i>Including social inequality in the educational policy agenda</i>																		
<i>Developing distance/virtual education</i>																		
<i>Targeted assistance to groups at risk and talent support</i>																		
Pillar 1.4. Ensuring the relevance of higher education																		
<i>Training Central Asia's future workforce</i>																		
<i>Developing and updating skills for the modern economy</i>																		
<i>Curricula modernization</i>																		
Pillar 2.1. Increasing research productivity of academic staff																		
<i>Providing incentives to enhance research productivity</i>																		
<i>Strengthening publication infrastructure</i>																		
<i>Promoting academic ethics</i>																		
Pillar 2.2. Building research capacity and excellence in higher education institutions																		
<i>Establishing a network of centers of excellence</i>																		

<i>Regional infrastructure for supporting cooperation between universities and research institutes</i>																		
<i>Modernizing scientific personnel training</i>																		
<i>Forming a pool of world-class researchers</i>																		
Pillar 2.3. Strengthening linkages between universities and industry																		
<i>Expanding technology transfer capacity</i>																		
<i>Developing new cooperation formats and incentives for industry and universities</i>																		
<i>Systematizing scientific and technical information and aggregating business requests for research and development</i>																		
Pillar 3.1. Establishing regional cooperation infrastructure																		
<i>Aligning strategic priorities of higher education development across Central Asian countries</i>																		
<i>Securing political and institutional support for regional cooperation</i>																		
<i>Promoting and supporting the creation of the Association of Leading Universities of Central Asia</i>																		
<i>Promoting the establishment of university alliances</i>																		
<i>Developing a plan of regular meetings and events.</i>																		
Pillar 3.2. Harmonizing the higher education space																		
<i>Development of effective mechanisms for the recognition of higher education,</i>																		

F. Areas of academic excellence in Central Asian countries and potential partners

Table F.1. Areas of academic excellence in Central Asian countries and potential partners

	Kazakhstan	Tajikistan	Kyrgyzstan	Uzbekistan
Anthropology and cultural studies				
Cultural heritage of the region Oriental studies Eurasian studies	Nazarbayev University Al-Farabi Kazakh National University KIMEP University L.N. Gumilyov Eurasian National University International Kazakh-Turkish University	Tajik National University	American University in Central Asia	Institute of Oriental Studies named after Abu Rayhan Beruni of the Academy of Sciences of the Republic of Uzbekistan “Manaviyat va Marifat” Center National University of Uzbekistan Tashkent State University of Oriental Studies
Ecology and Environmental Management				
Global warming and climate change Water resource management		Tajik State Pedagogical University named after S. Aini University of Central Asia	University of Central Asia	Tashkent Institute of Irrigation and Agricultural Mechanization Engineers Center for Advanced Technologies
Information Science and Information Technologies				
IT Business Information Science	Kazakh National Technical University International Information Technology University Satbayev University Astana IT University Süleyman Demirel University	Technological University of Tajikistan Tajik Technical University named after Academician M.S. Osimi	University of Central Asia Ala-Too International University Kyrgyz State Technical University High Technology Park of the Kyrgyz Republic	Tashkent University of Information Technologies Inha University in Tashkent IT Park University
Engineering and Technologies				
Engineering Mechanics	Nazarbayev University Satbayev University	Tajik Technical University named after Academician M.S. Osimi	Kyrgyz State Technical University	Turin Polytechnic University in Tashkent

Mechanical Engineering Industrial and civil construction Mining Oil exploration	Kazakh British Technical University Karaganda Technical University Kazakh National Research Technical University	Mining-Metallurgical Institute of Tajikistan		Tashkent State Technical University named after Islam Karimov Educational and production cluster in oil and gas sector Navoi State Mining Institute
Agricultural Sciences				
Irrigation Agriculture mechanization New agricultural technologies Digital agriculture	Kazakh National Agrarian Research University	Tajik Agrarian University named after Sh. Shotemur	Technopark of Kyrgyz State Technical University named after Razzakov Kyrgyz National Agrarian University named after K.I. Scriabin	Tashkent Institute of Irrigation and Agricultural Mechanization Engineers Tashkent State Agrarian University International Agricultural University University of Digital Economics and Agrotechnologies
Medicine				
Oncology Gastroenterology Cardio-vascular diseases	Kazakh National Medical University Nazarbayev University	Avicenna Tajik State Medical University	I. K. Akhunbaev Kyrgyz State Medical Academy Osh State University	Tashkent Medical Academy
Physics and Mathematics				
Physics and Mathematics Mathematical physics	Nazarbayev University Süleyman Demirel University	Tajik National University Tajik State Pedagogical University	Kyrgyz National University named after Jusup Balasagyn	V. I. Romanovsky Institute of Mathematics National University of Uzbekistan
Chemistry and Biology				
Chemistry and Biology		Tajik National University Tajik State Pedagogical University named after S. Aini		National University of Uzbekistan Tashkent Chemical-Technological University Tashkent Pharmaceutical University
Business and Economics				
Business and Economics	KIMEP University	Tashkent State University of Finance and Economics	Kyrgyz-Turkish Manas University	Tashkent State University of Economics

International economic relations	KAZGUU University named after M. Narikbayev	Tajik State University of Law, Business and Politics	Kyrgyz Economic University University of Central Asia	Westminster International University in Tashkent
Regional Economic Development	Narxoz University Almaty Management University Süleyman Demirel University			