Kazakhstan Green Jobs and Skills Assessment: Preliminary Report

Prof. Alberto Frigerio (PhD)

Almaty Management University

ABBREVIATIONS AND ACRONYMS

Agri-tech: Agricultural technology

AI: Artificial intelligence

AlmaU: Almaty Management University

DKU: Kazakh-German University

ESG: environmental, social and governance

ILO: International Labour Organization

KazNARU: Kazakh National Agrarian Research University

NQS: National Qualifications System

NU: Nazarbayev University

OSCE: Organization for Security and Cooperation in Europe

R&D: research and development

RES: renewable energy sources

SDG: Sustainable Development Goals

SDSN: Sustainable Development Solutions Network

SMEs: Small and medium enterprises

UNDP: United Nations Development Programme

UNEP: United Nations Environment Programme

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EXECUTIVE SUMMARY

1. Scope and methodology

In the contemporary global economic landscape, the imperative for nations to embrace a shift towards low-carbon, circular, and sustainable economies is echoing across the world. The recognition of green jobs as essential for environmental preservation and economic prosperity can be seen in their ability to support the development of sustainable practices and contribute to the restoration, preservation, and improvement of the natural environment across various economic sectors. However, challenges such as job displacement, skill gaps, and social inequality must be addressed through comprehensive social and labor market policies. Moreover, despite remarkable progress in recent years, Georgia continues to fall behind in implementing plans and strategies to train the workforce for 'green employment' and ensure competent and certified staff. Thus, there is a need to modernize the educational system to satisfy the impending demand from the green employment market.

This report examines the state of the green transition in Kazakhstan, focusing on the rise of green jobs and the development of green skills through education and training programs. The main goal is to provide policymakers, educators, and other stakeholders with insights on how to facilitate the development of green jobs and skills in the country. Methodologically, this study employs a mixed-methods approach, combining a thorough literature review, semi-structured interviews with key stakeholders from academia and business, and a focused analysis of recruitment platforms. The data from these sources have been triangulated to ensure a comprehensive and reliable understanding of the green scenario in Kazakhstan.

2. The green transition framework in Kazakhstan

Kazakhstan is actively navigating its transition to a green economy through a multifaceted legislative and policy framework. Key milestones include the approval of the “Law on Support for the Use of Renewable Energy” (2009), the “Concept for the Transition to a Green Economy” (2013), and the new “Environmental Code” (2021). The “Strategy Kazakhstan-2050” further underscores the nation's dedication to a sustainable future as part of its path toward prosperity. This perspective is further strengthened by policies such as the “Concept for the Transition to a Green Economy” (2013) and the “Doctrine for Achieving Carbon Neutrality by 2060” (2021). Moreover, in addition to the above-mentioned legal and policy measures, the government has introduced economic mechanisms, national projects, and patterns of international collaborations to support the green transition process. The approvals and implementation of these measures have led to significant green business trends in Kazakhstan, including efforts related to climate change, agro-industrial transformation, green job creation, adoption of green technologies, transparent reporting, growth of green finance, sustainable territorial development, water management, and increased utilization of renewable energy sources.

Even though there has been notable progress in the green transition, there are still significant challenges that need ongoing attention to ensure success and sustainability. A significant hurdle lies in the lack of awareness and a green skills gap, necessitating comprehensive educational and training programs. Likewise, public campaigns are needed to enhance understanding of green technologies. The country faces also difficulties in attracting green investments due to institutional uncertainties, unfavorable lending conditions, and risks associated with off-take contracts. Moreover, there is limited demand for green products/services and persistent financial constraints, hindering businesses from investing in green initiatives. Regulatory inconsistencies and legal ambiguities pose further barriers to the effective implementation of the green transition, with

inadequate frameworks for ESG factors and green finance. Within the renewable energy sector, challenges include substantial investments in fossil fuels, low tariff systems, and high initial capital requirements. Resistance to the green transition is further fueled by concerns about costs, knowledge gaps, and a reluctance to change established routines.

To facilitate Kazakhstan's transition to a green economy, a set of key recommendations can be outlined. Firstly, there is a crucial need to implement targeted training and capacity-building programs to equip the workforce with the necessary skills for the green economy. Additionally, modifying ecological taxation to focus on activities harmful to the environment and the workforce is essential. Enhancing financing instruments for green initiatives, introducing pricing mechanisms, and making legislative improvements might contribute to promoting renewable energy projects and sustainable economic practices. Furthermore, launching targeted support for Research and Development (R&D) to invent and commercialize innovative green technologies will play a pivotal role in the successful transition to a green economy in Kazakhstan.

3. Green job market analysis of Kazakhstan

Kazakhstan exhibits substantial potential for green employment across various sectors. The Kazakhstan Bureau of National Statistics indicates that approximately 48,895 people were employed in "green jobs" in medium-sized enterprises, with an additional 8,608 in small enterprises in 2022. Notably, the renewable energy sector has experienced significant growth, employing 1,660 people in January 2023, with a noteworthy gender distribution revealing increased female representation. Key areas of environmental investments include renewable energy, water management and wastewater treatment, and climate change issues.

The analysis of the green job announcements in online portals like LinkedIn and HeadHunter suggests that, to date, some of the most demanded green skills in the Kazakh market are: natural resources management, environmental law, environmental economics, climate change, environmental management, water resources management, and renewable energy. The analysis of the interviews with experts from academia and business reveals a projected demand for green jobs related to green technologies, ESG consulting, sustainability audits, and environmental management. The demand for expertise in big data analysis, sustainability assessment and reporting, and green policy development is expected to grow as well as the opportunities for professionals with a holistic understanding of legal, socio-economic, and technical aspects in diverse green areas. Further advanced research and comprehensive data analysis of the green job market in Kazakhstan are, nevertheless, required for a more detailed understanding of the state of green employment in the country and the related request for green skills.

One of the main challenges constraining the analysis of the green job market in Kazakhstan is the absence of a clear, well-articulated, and publicly recognized definition of "green jobs". A precise definition is vital for policy guidance, training program development, and strategic investments. Moreover, there is a notable gap in understanding the role of green skills among the population of Kazakhstan. Recognizing the importance of green skills for long-term business success and viability is a key condition to cultivate them. But most of all, Kazakhstan faces a significant hurdle with the absence of an effective monitoring system for green jobs. Establishing such a system at a national level is essential for tracking the growth and impact of environmentally sustainable employment, assessing policy effectiveness, and identifying areas requiring additional support.

To enhance the green job market in Kazakhstan and address existing gaps, three structured actions should be implemented. Firstly, there is a need to update the policy framework by providing a clear definition of green jobs and distinguishing between dedicated and integrated green roles.

Secondly, a public communication campaign should be employed to face the current lack of awareness. A mix of channels such as traditional media, online platforms, and community events should be used to reach diverse targets. This campaign should emphasize the tangible economic benefits and environmental gains of green jobs while highlighting local success stories to gather public support. Lastly, the establishment of a measurement and classification system for green jobs is crucial to leveraging advanced analytics and tracking systems. Alignment with international standards, such as those by the ILO and UNEP, should be ensured, and a feedback mechanism involving multiple stakeholders should be created for continuous improvement and periodic reviews of the green job market initiatives.

4. Educational environment and green skills in Kazakhstan

In Kazakhstan, the focus on green education and training is evident through increasing government expenditures on scientific and technical projects related to the green economy. However, the number of graduates in environmental specialties has shown fluctuations, with a decline after a peak in 2020. While environmental specialties represent only a niche within "green specialties," attention to sustainability and environmental responsibility in higher education is growing. Several universities, such as Almaty Management University, Kazakh-German University, Kazakh National Agrarian Research University, and Nazarbayev University, are integrating sustainability and green skills into their curricula, fostering experiential learning, and creating green campus initiatives. Additionally, professional green training is offered by institutions like the Qazaq Green Association, Green Academy, and the NJSC "International Green Technologies and Investment Projects Center," with a focus on renewable energy, green business, and clean technologies.

And yet, even if the development of green skills in Kazakhstan is following a promising trend, significant gaps and barriers persist. Among the obstacles are a gap between youth and societal expectations, limited understanding of green skills, and resistance to change. Moreover, training programs are limited, employer awareness is low, and green competencies are not emphasized in formal education. Quality concerns revolve around the lack of a systematic approach, a too-fragmented education, and weak experiential learning. A comprehensive plan is essential to overcome these barriers, fostering an environment conducive to the effective development and adoption of green skills as well as contributing to Kazakhstan's long-term green transformation.

The action plan designed in this report to promote green skills in Kazakhstan involves a multifaceted approach targeting three core areas: the willingness to learn, the accessibility to learning opportunities, and the quality of available educational and training programs. Initiatives to increase willingness to learn include the organization of public campaigns aimed at raising environmental awareness, the launching of an online platform dedicated to green jobs, and the opening of community-based learning centers to foster green experts in the whole territory of Kazakhstan. To enhance accessibility, the plan suggests recognition programs for companies investing in green training, integrating sustainability principles and green skills into educational curricula as well as opening new specialized programs focused on technical green areas, and collaborating with existing training centers to promote retraining paths for diverse categories of people. Enhancing the quality of green skills involves implementing hands-on experiential learning, offering incentives for internationally recognized certifications, and establishing a comprehensive infrastructure. This includes creating a database of technical green experts and forming a consortium that brings together universities, training centers, NGOs, and green companies to provide high-quality green professional training with improved territorial distribution, covering a diverse range of green skills, and ensuring a holistic approach to sustainable education.

1. INTRODUCTION

1.1 The purpose and scope of the "green jobs and skills assessment project"

In the complex economic landscapes of the 21st century, the pressure for states to embrace a transition towards low-carbon, circular, and sustainable economies is a resounding call for immediate action echoing from every corner of the globe. This urgency is grounded in the sobering reality that climate change knows no borders. The global catastrophic events, ranging from extreme weather phenomena to escalating biodiversity loss, serve as stark reminders of the consequences of inaction. Therefore, the call for sustainability is an urge for countries to reassess their economic paradigms while progressively reducing their dependence on fossil fuels.

With the approval of the 2015 Paris Agreement and the Sustainable Development Goals (SDGs), the international community has set forth the need to incorporate environmental and social responsibility into economic strategies through a green transition process. Each state must take action against global warming and create a sustainable economic system. As defined in the World Commission on Environment and Development's 1987 Brundtland report 'Our Common Future', the ultimate goal is to 'meet the needs of the present without compromising the ability of future generations to meet their own needs'. (World Commission on Environment and Development 1987, section 27)

Turning such a vision into reality entails a systemic process of transformation. From a political-legal perspective, governments need to adopt laws and implement regulations aimed at encouraging sustainable business practices and the transition to a circular economy. From a corporate profile, it is important to deal with the issues of eco-business development by monitoring the rising green jobs market and the related opportunities for investments. From an educational perspective, schools and universities must enhance their academic programs to cultivate the attitudes, expertise, and skills of tomorrow's responsible leaders.

As a result, there is growing attention toward the rise of green jobs and their related skills. The International Labour Organization (ILO 2016) defines green jobs as 'decent jobs in any economic sector (e.g. agriculture, industry, services, administration) that contribute to preserving, restoring, and enhancing environmental quality' by:

- improving the efficiency of energy, raw materials, and water;
- de-carbonizing the economy and bringing down emissions of greenhouse gases;
- minimizing or avoiding all forms of waste and pollution;
- protecting or restoring ecosystems and biodiversity;
- and supporting adaptation to the effects of climate change.

Within such a general definition, it is possible to distinguish between two categories of green jobs: on one side, dedicated green jobs, which are fully directed toward the realization of green goals and environmental protection; on the other side, integrated green jobs, in which green skills and sustainability practices are incorporated into existing professions. (UNDP 2018) For example, solar panel installers and environmental scientists are two professions belonging to the list of dedicated green jobs, while a sustainable finance professional or a green supply chain manager tends to be associated with the list of integrated green jobs. Of course, such a distinction is a social construction, thus entailing a certain flexibility and ambiguity. Likewise, up to now, specific statistical parameters to identify and distinguish "green jobs" from other occupations have not been identified yet. Nevertheless, such a categorization is a valuable analytical tool, serving as a lens through which it is possible to understand the complex and evolving landscape of green

employment and provide insights crucial for strategic planning, policy formulation, and sustainable development initiatives.

On the whole, green jobs not only contribute to fighting climate change and environmental degradation, but they can also boost states' economies and create new job opportunities. According to the World Employment and Social Outlook (ILO 2018), achieving the Paris Agreement will result in 18 million more jobs, the transition to a circular economy will generate 6 million new jobs, and 1.2 billion jobs will only be preserved by supporting a stable and healthy environment. However, such a process of transformation entails also some risks such as job displacement, supply chain disruptions, and an exacerbation of social inequality. To mitigate such adversities, social and labour market policies need to complement economic and environmental measures because there cannot be a sustainable green transition path without simultaneously thriving social equity, inclusivity, and justice.

Another challenge is represented by the risk of significant skill gaps. Green jobs are open to diverse backgrounds and they require a diverse set of both hard and soft skills. At the same time, their execution entails the acquisition of certain technical "green skills" (e.g. corporate sustainability, ESG foundations, environmental advocacy, etc.), which are here defined as those knowledge, abilities, and values that enable the environmental sustainability of economic activities and support the integration of green technologies and processes in diverse professional settings. (Pavlova 2017) Retraining workers, upgrading their skills, and/or providing the right green skills to new workers is, therefore, a fundamental condition to sustain the green transition process in the long term. So, a green talent pool needs to be cultivated by adequately retraining the current workforce and adapting the curricula of educational institutions to the evolving job market. At present, however, the demand for green talent is outpacing the available supply. (LinkedIn 2023) Indeed, much remains to be done.

Considering such a framework, this project aims to conduct a preliminary assessment of the rise of green jobs and skills in Kazakhstan. Through a combined analysis of top-down (e.g. policy frameworks, regulatory measures, and economic trends) and bottom-up initiatives (e.g. business climate, university curricula, and professional training) the goal is to provide a holistic understanding of the landscape for green employment and propose recommendations for fostering green jobs and skills in the country. In the specific, this study intends to:

- Offer an overview of the state of green transition in Kazakhstan.
- Define the state of the green jobs landscape in the country by considering aspects such as demanded employment figures, job types, and required competencies.
- Assess the alignment of existing educational and training programs with the needs of the green jobs market.
- Propose cohesive and effective strategies for improving the education and skills development required for green employment.

Addressing the green transition and the rise of the green jobs market in Kazakhstan is critical since this country has an economy traditionally reliant on the extraction and export of natural resources, particularly in the energy sector. Therefore, the sustainability of this economic system faces scrutiny due to the finite nature of these resources and the need to diversify economic activities for long-term resilience. Moreover, the rapid urbanization, industrialization, and economic growth that has been experienced in the last three decades have led to noteworthy cases of environmental degradation. Pressing issues such as air and water pollution, deforestation, and habitat loss have become increasingly evident, necessitating a reassessment of economic practices to mitigate

environmental harm. Embracing a green transition is, therefore, a condition of paramount importance to secure a sustainable future and address such pressing environmental concerns, while positioning themselves as leaders in the global transition towards green economies. Insights revealed in this study can, therefore, inform policy-makers and business developers about current barriers hindering the green transition process as well as present new opportunities to foster green job creation, reduce environmental impact, and improve quality of life.

Structurally, this report is organized to ensure a comprehensive and systematic exploration of the green transition in Kazakhstan, from legal frameworks and business trends to the job market and educational landscape. Section 1 establishes the purpose, scope, and methodological approach of the project. Section 2 delves into the green transition framework, examining legal reforms, policy measures, and green business trends, and outlining the main challenges and recommendations in the green transition process. Section 3 conducts a thorough analysis of the green job market, exploring the current state of green employment, specific job types in demand along with related green skills, and presenting challenges and recommendations for the development of a systemic assessment of the green job market. Section 4 focuses on the educational environment, assessing the state of green educational and training programs, identifying gaps and barriers hindering the development of green skills, and proposing an action plan to foster green skills in Kazakhstan. Finally, the report concludes in Section 5, summarizing key findings and insights. The bibliographical resources (Section 6) provide transparency by listing academic literature, official public documents, reports, and websites used for the research.

1.2 Methodological framework

This report is the result of research activities conducted in the period between mid-January to mid-February 2024. Figure 1 schematically represents the methodological approach of this study in its different phases.

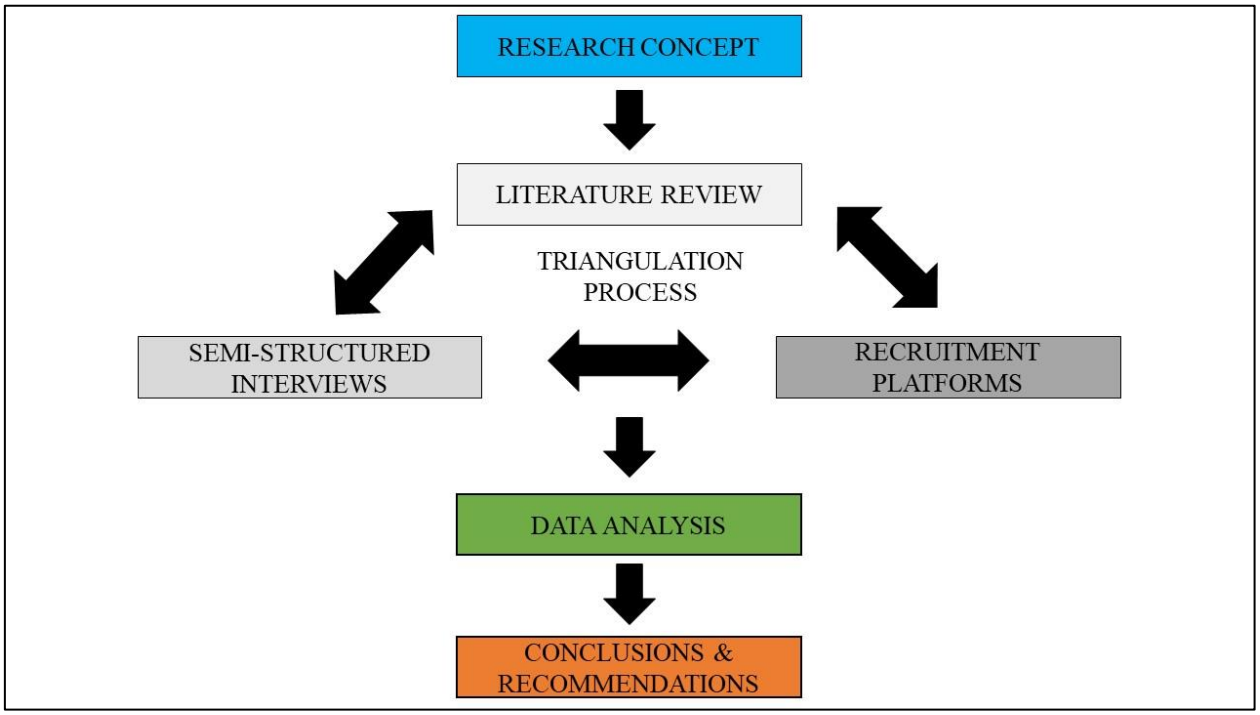

Figure 1. Methodological approach and triangulation process. Source: author.

Three distinct yet complementary sets of sources have been used to collect wide-ranging data on the green transition processes in Kazakhstan:

- A comprehensive literature review and official document analysis: The initial phase of data collection involves a meticulous review of the published academic literature and the released official documents on the green transition processes in Kazakhstan. This comprehensive assessment serves as the foundational knowledge base, allowing for an in-depth understanding of the historical context, policy frameworks, and key milestones in the green transition journey.
- Semi-structured interviews with key stakeholders: To supplement and enrich the insights obtained from the literature review, eight semi-structured interviews have been conducted with representatives from academia and business in Kazakhstan (see Annex 1 for details). This qualitative approach aims to capture the perspectives, experiences, and opinions of key stakeholders directly involved in or affected by the green transition. Each interview lasted approximately 30 minutes. Two diverse sets of questions have been prepared for academicians and people working in business.
- Analysis of recruitment platforms for assessing green job demand and skills: In recognition of the pivotal role that employment and skill development play in sustainable transitions, this research has scrutinized two of the most popular recruitment portals in Kazakhstan – LinkedIn and HeadHunter.kz – to specify the skill set required for newly created green occupations and redesigned conventional professions. This approach provides a real-time snapshot of the evolving job market, thus offering valuable data on the practical implications of the green transition for employment and skill requirements.

By combining the information gathered from these different sources through a triangulation process, it has been possible to improve the accuracy, credibility, and comprehensiveness of the findings, thus leading to a deeper understanding of the intricate factors involved in the emergence of green jobs and the growth of green skills in Kazakhstan.

The material that had been collected during the research process was subsequently coded methodically and organized logically so that it could be evaluated and presented through the application of extensive content analysis. Based on the identified insights, this report offers an indicative evaluation of the green transition in Kazakhstan as well as provides a series of actionable recommendations aimed at cultivating a workforce that is knowledgeable in sustainable practices and proficient in green skills.

2. THE GREEN TRANSITION FRAMEWORK

2.1 Legal and policy measures

Kazakhstan is managing its transition to a green economy through a complex, dynamic, and evolving legislative and policy framework. The approval of the "Environmental Code" (2007) was the first symbolic step toward the development of a green transition process in the country. Such a legal document, in association with the Law on "Support for the Use of Renewable Energy" (2009), introduced a series of measures aimed at protecting the environment and its biodiversity as well as supporting the development of the renewable energy industry in Kazakhstan.

The successive entrance into force of the Law "On Energy Saving and Increased of Energy Efficiency" (2012) and the adoption of the new "Environmental Code" (2021) confirmed Kazakhstan's willingness to keep enhancing and updating its legal system on the protection of the environment and the promotion of green resources and energy saving systems following the last technological innovations and international legal trends.

The year 2010 was, however, the real turning point with the adoption of the "Astana Green Bridge Initiative" and the "Green Bridge Partnership Program". These programs stand out as pioneering mechanisms to attract green technologies and investments in Kazakhstan while fostering internal capacity building – particularly in renewable power generation and clean product production – and nurturing a systemic collaboration across political institutions, economic structures, and international organizations.

This commitment was further reinforced with the "Strategy Kazakhstan-2050", an ambitious initiative that was introduced by former Kazakh President Nursultan Nazarbayev in 2012 to integrate economic, social, institutional, and ecological aspects in a long-term development plan. The strategy unequivocally emphasizes the country's unwavering dedication to the progressive development of a green economy as a key step to becoming one of the 30 most developed economies in the world by 2050.

The "Concept for the Transition to a Green Economy" (2013) represented both the official institutional support and strategic foundation of green growth in Kazakhstan. The document defines a "green economy" as an economy with high living standards and a careful and rational use of natural resources in the interests of present and future generations as well as following the international environmental obligations assumed by the country.

According to the Concept, the transition to a green economy not only holds the potential for tangible benefits, including improved well-being, resource savings, environmental protection, increased competitiveness, enhanced energy security, and job creation with income growth but also positions Kazakhstan on a promising trajectory toward a sustainable and environmentally conscious future. (Dabyltayeva and Rakhymzhan 2019). Accordingly, the main areas of intervention to achieve a successful transition to a green economy are:

- Effective water management;
- Modernization of agriculture;
- Energy saving and energy efficiency improvement;
- Energy development;
- Waste management;
- Air pollution reduction.

On the whole, the implementation of the Green Economy Concept is planned to be achieved in three stages:

- 2013-2020: the first phase priorities the creation of green infrastructure and the optimization of resource utilization to boost environmental protection;
- 2020-2030: the second phase focuses on the promotion of a rational use of water sources, the development and spreading of renewable energy technologies, and the building of new facilities that meet strict energy efficiency requirements;
- 2030-2050: the third phase entails the complete transformation of the national economy to embrace a sustainable use of natural resources on the condition of renewability.

To date, Kazakhstan is working on the completion of its second phase. In this regard, the President of the Republic of Kazakhstan Kassym-Jomart Tokayev has relaunched public attention toward the green transition with the "Doctrine for Achieving Carbon Neutrality of the Republic of Kazakhstan until 2060" (2021), which sanctioned Kazakhstan's ambitious pledge to achieve carbon neutrality by 2060.

Beyond the legal and policy measures, other initiatives have been taken by the government to foster the green transition process in Kazakhstan. First, Kazakhstan introduced diverse economic mechanisms to support the adoption and spread of green practices. Among them are customs duty exemptions, government grants, tax preferences, and investment subsidies to facilitate financial incentives for green projects; exemptions of renewable energy sources from electricity transmission fees to encourage investment in renewable energy; and no licensing requirement for energy generation to simplify the regulatory processes for green energy initiatives. Likewise, the Kazakh government has introduced financing instruments like green bonds, green loans, carbon credits, and green funds to support sustainable economic development, conserve natural resources, and reduce environmental pollution.

Second, to drive sustainable development, Kazakhstan has embarked on diverse national projects. An example is the National Project for the Development of the Agro-Industrial Complex 2021-2025, a comprehensive initiative that addresses critical aspects, including reducing land degradation, improving water management, decreasing greenhouse gas emissions, enhancing biodiversity, and fostering a circular economy. Another example is the "Zhasyl Kazakhstan" project (Green Kazakhstan project) 2021-2025, which is structured on four key initiatives: "Taza Kazakhstan", focusing on air quality, waste management, and ecosystem preservation; "Unemdi Kazakhstan", targeting water and energy efficiency; "Tabigat", an ambitious tree-planting effort to restore biodiversity; and "Ecologia Bolashagy", aiming to elevate the level of environmental education and culture among the population.

Third, Kazakhstan has signed several bilateral agreements with diverse foreign countries to attract foreign direct investments and develop strategic partnerships in the green fields. For example, the Italian energy multinational ENI Plenitude, through its subsidiary Arm Wind, has built two wind farms - Badamasha 1 and 2 (96 megawatts in total) - in the Aktobe region and a 50-megawatt solar plant, with over 93,000 solar panels, in the Turkistan region. After the official visit of Tokayev to Italy in January 2024, other green projects will be jointly developed in the next years.

Fourth, Kazakhstan concluded multiple agreements of cooperation with diverse international partners such as UNDP, UNEP, Asian Development Bank, European Bank for Reconstruction and Development, OECD, World Bank, and others. In some cases, this collaboration has led to the implementation of special programs like, for example, the "Sustainable Cities for Low-Carbon Development in Kazakhstan", the "Protection of the Marine Environment of the Caspian Sea", and

the “Water and Wastewater Infrastructure Modernization”. In others, as in the collaboration with the OECD, it led to the integration of 44 new green growth indicators into the national statistical system. Overall, cultivating robust international partnerships increases Kazakhstan's access to invaluable expertise and resources and it positions the country as a proactive player in the worldwide shift towards a more sustainable future.

Finally, Kazakhstan has organized special events to increase public awareness. EXPO-2017 on “Future Energy” was plausibly the most popular one. Moreover, the Kazakh government has supported the establishment of *ad hoc* institutions like the International Green Technologies and Investment Projects Centre, the Green Finance Centre at the Astana International Financial Centre, and the Financial Settlement Center of Renewable Energy to endorse the green transition through funds, technology, and innovation.

Table 1 sums up the main mechanisms aimed at fostering the green transition in Kazakhstan.

TABLE 1.
IMPLEMENTED MECHANISMS OF GREEN TRANSITION IN KAZAKHSTAN

LEGISLATION	POLICY	OTHER INITIATIVES
Environmental Code (2007)	Astana Green Bridge Initiative (2010)	Economic and Financial Support Mechanisms
Law on Support for the Use of Renewable Energy (2009)	Green Bridge Partnership Program (2010)	National Projects
Law On Energy Saving and Increased of Energy Efficiency (2012)	Strategy Kazakhstan-2050 (2012)	Bilateral Agreements
New Environmental Code (2021)	Concept for the Transition to a Green Economy (2013)	Collaboration with International Organizations
-	Doctrine for Achieving Carbon Neutrality until 2060 (2021)	Special Events and Institutions

On the whole, the green transition in Kazakhstan has the potential to bring significant benefits to the country. For instance, the development of renewable energy sources can reduce dependence on fossil fuels and create new job opportunities in the renewable energy sector. Additionally, the implementation of sustainable practices in industries can lead to cost savings and increased competitiveness. As a result, there are socioeconomic, environmental, and political benefits associated with a smooth, consistent, and cohesive green transition in Kazakhstan.

2.2 Green business trends

In light of recent literature and research conducted by various authors, Kazakhstan seems experiencing a boom in diverse green business areas. Here below is a brief sum up of the most significant trends.

Actions on climate change and carbon emissions reduction: Kazakhstan has set ambitious goals for carbon neutrality by 2060. Intermediate goals include optimizing the emission trading system, reducing coal's share in electricity generation, increasing the share of renewable energy resources, and improving overall energy efficiency. However, while Kazakhstan's commitment to a green transition is commendable, the transformation of the energetic system will proceed with gradual steps: for instance, coal ensured more than half of domestic primary energy consumption in 2021

and it will plausibly preserve an important share in the country's energy balance up to 2040. (Zhanadilova et al., 2022)

Agro-industrial transformation: the agro-industrial complex stands out as a promising sector for green transformation. Abuova et al. (2023) advocate for targeted government programs and the role of digital technologies in reshaping agricultural production models, stimulating rural economic development, and reducing unplanned expenditures. Nevertheless, a successful transformation of the agricultural system is directly associated with impactful interventions in the water management system as agricultural production is the most water-intensive sector in Kazakhstan. (Saparova and Saginova 2022)

Creation of green jobs: the country places a strategic focus on creating green jobs across diverse sectors, encompassing public transport, renewable energy, construction, waste management, and socially responsible enterprises. This approach aims to stimulate economic growth, reduce unemployment, and foster social and environmental responsibility. (Rakhimzhanova, 2023) And yet, it is questionable how much time might be needed to address the existing skills gap and achieve systematic changes in the business field.

Implementation of green technologies: Kazakhstan actively pursues the implementation of green technologies, emphasizing environmentally friendly practices and innovations. The widespread deployment of these technologies aims to reduce environmental impact as well as to enhance operational efficiency. (Mukhtarova and Zhidebekkyzy 2015) The production of environmentally friendly products – goods obtained using green technology and equipment – has reached 91,322 million tenge in 2022, thus achieving an increment of over 55% compared to the previous year. (Bureau of the Kazakh National Statistics 2023) A successful transition to green technologies, however, requires substantial investments in infrastructure as well as the adoption of supportive policies and regulations.

Increased transparency and accountability in the reporting system: a trend towards increased transparency and accountability is evident in Kazakhstan's environmental impact reporting. Organizations emitting significant greenhouse gas emissions are now required to disclose their outputs, aligning with sustainable development goals and economic modernization. (Poberezhskaya and Bychkova 2022) While such a requirement is a positive step towards aligning with sustainable development goals and economic modernization, ensuring compliance and enforcing reporting standards still poses significant hurdles.

Rise of green finance: green finance in Kazakhstan is still at an early stage, but gradually developing, with the market estimated at $250 million in July 2022. (Yessymkhanova et al. 2023) Overall, there is a growing awareness of environmental, social, and governance (ESG) risks among the government, regulatory authorities, companies, and financial institutions. (Doszhan et al. 2022) However, the level of green investments is currently insufficient to ensure sustainable green development and the country lags behind advanced countries in terms of regulation of ESG factors and the implementation of green instruments in the economy.

Sustainable territorial development: sustainable territorial development emerges as a crucial paradigm in Kazakhstan. It involves integrating environmental protection, economic development, and human capital management within the framework of a green economy (Rakhimzhanova 2023). This multifaceted approach underscores the recognition that the well-being of both the environment and society is intricately linked with sustainable economic practices. Likewise, it entails the embracement of green practices in urban planning and construction. In this regard, the volume of work performed on the "green" construction has quintupled between 2013 and 2022,

reaching a quota of over 165,447 million tenge. (Bureau of the Kazakh National Statistics 2023) Overall, the rising attention toward sustainable territorial development in Kazakhstan reflects a commitment to long-term resilience and responsible stewardship of resources.

Sustainable water management: Kazakhstan expects an increase in water demand and a decrease in water resource availability, thus the need for integrated water cycle management. (Meyer and Lundy 2014) To ensure the country's water security and address the problem of water scarcity, a water infrastructure development project has been developed for the period 2024-2030. The plan involves the construction of 20 new water basins and the reconstruction of another 15 already present in the area. If successful, this measure will also help reduce Kazakhstan's dependence on neighboring countries for water supply by 25%; otherwise, water scarcity will be one of the main constraining factors for the development of the country in the future.

Use of renewable energy resources: Kazakhstan is proceeding with the development of legal instruments, government programs, and incentives to support clean energy initiatives (Novikov and Kelly 2014). On the whole, the transition to renewable resources is viewed as an opportunity to foster a more sustainable and resilient eco-economic state with positive effects in areas like resource efficiency, environmental protection, economic growth, energy security, and social well-being (Onyusheva, Ushakova, and Tran Van 2018). As a result, the number of facilities using renewable energy sources has significantly increased in the last years: 43 wind farms, 40 small hydropower plants, 53 solar plants, and 5 biofuels facilities were operative in 2022. (Zhanadilova et al. et al. 2022). In turn, the share of renewable energy sources in total electricity production reached quota 5%. Nevertheless, transforming the economic system of a fossil fuels-extracting country like Kazakhstan will require further financial, political, and technological arrangements.

On the base of such trends, it seems that ten main green business areas are currently growing in Kazakhstan, as schematically represented by Figure 2. They are climate change and carbon reduction; renewable energies and energy efficiency; sustainable water management; agroecological transformation; green entrepreneurship; natural resources management; green finance; sustainability audit; green construction; and integrated planning and policy making.

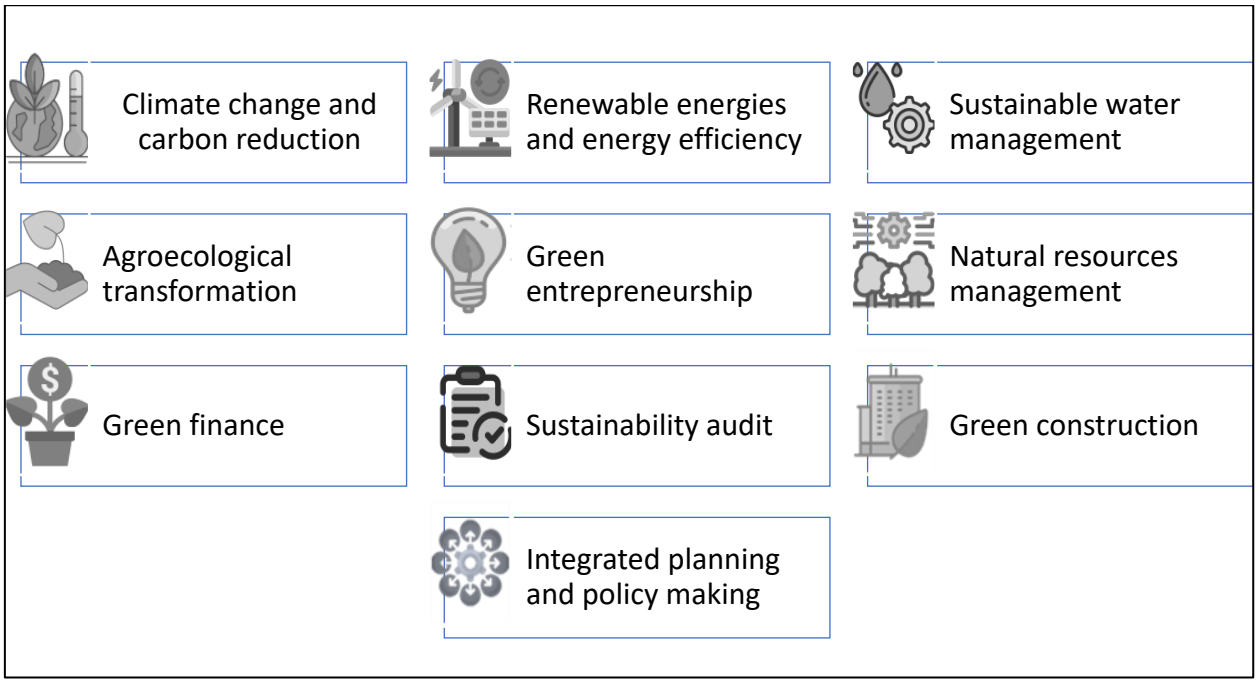

Figure 2. Emerging green business areas in Kazakhstan. Source: author.

2.3 Main challenges and recommendations in the green transition process

Successfully achieving sustainable growth throughout the transition to a green economy necessitates the efficient handling of several correlated issues. To overcome the primary obstacles hindering the green transition in Kazakhstan, a thorough approach is needed to understand the complex nature of these challenges.

One of the primary impediments to Kazakhstan's green transition is the persistent lack of financial resources and insufficient funding for environmental policies, green technology investments, and modernization efforts. (Diyar et al. 2014; Abzhalelova and Kozhan 2022; Rakhimzhanova 2023) As highlighted by Doszhan et al. (2022), the lack of a comprehensive regulatory framework for green finance and poor collaboration among stakeholders exacerbate the financial issue, thus hindering the implementation of sustainable projects. Moreover, the current limited demand for green products and services, accompanied by pervasive market uncertainties, are noteworthy challenges for businesses seeking to invest in green initiatives in Kazakhstan. (Abzhalelova and Kozhan 2022)

A further challenge is related to the limited capacity to attract green investments. This condition poses a significant hurdle to the growth of environmentally sustainable practices in Kazakhstan. (Diyar et al. 2014; Doszhan et al. 2022; Kairatkyzy et al. 2023) Uncertainties of the institutional context, as noted by Mukhtarova and Zhidebekkyzy (2015), generate a certain reluctance among investors. For instance, the recurrent devaluation of tenge, unfavorable lending conditions, and the risks of shortcomings in off-take contracts are all factors discouraging green investments in Kazakhstan. (Lim et al. 2021) Abdildin et al. (2021) emphasize the need to introduce financial incentives, which are currently lacking in the country, while Kairatkyzy, Khoich, and Demiral (2023) specifically highlight how the current limited availability of green financial products restrict the options for investors and businesses seeking to finance green projects.

Some gaps in the regulatory framework, coupled with widespread legal uncertainties, represent other challenges in the implementation of the green transition. (Lin et al. 2021; Kairatkyzy et al. 2023) For example, as noted by Doszhan et al. (2022), Kazakhstan's regulatory framework for ESG factors and green finance is insufficient, lagging behind more advanced countries. Likewise, uncertainty regarding the resolution of legal disputes hampers the growth of renewable energy technologies. (Koulouri and Mouraviev 2018) Moreover, as pointed out by Abdildin, Nurkenov, and Kerimray (2021), the regulatory frameworks lack comprehensive strategies and policy implementation instruments to effectively support the adoption of sustainable practices. Therefore, the existing governance structures and mechanisms lack effectiveness and fail to provide a conducive environment for the large-scale development of green projects.

Another recurring obstacle that impedes the development and implementation of sustainable traditions in Kazakhstan is the lack of awareness about environmentally friendly technology and practices. (Diyar et al. 2014; Abdildin et al. 2021) Overall, there is an urgent need for comprehensive awareness campaigns and educational programs to bridge the knowledge gap. According to Rakhimzhanova (2023), educating the population about the benefits of green technologies is crucial for fostering their widespread adoption, while for Diyar et al. (2014) investing in training and education programs is a key step to developing a workforce that is equipped to drive the green transition.

Resistance to the green transition is identified as a multifaceted challenge, encompassing concerns about costs, lack of understanding, and reluctance to change established routines. (Rakhimzhanova 2023) As stated by Abzhalelova and Kozhan (2022), the adoption of new green technologies may

require significant technological advancements and expertise. This condition can pose significant challenges for local industries and organizations. As a result, they might forbear going green due to the considerable costs and difficulties involved in upgrading technology and gaining expertise, even though these changes could bring significant environmental as well as socio-economic benefits in the long term. This is evident, for example, in the agricultural sector, which is characterized by the prevalent use of outdated methods and an insignificant employment of digital technologies. (Saparova et al. 2022) As a result of this lack of access to modern agricultural equipment and technologies, sustainable farming methods cannot be developed effectively. (Onyusheva, Ushakova, and Tran Van 2018)

Finally, there are sector-specific challenges to consider. Let's focus here on renewable energy, an area where Kazakhstan is making notable gains but is still constrained by many obstacles. First of all, Kazakhstan faces difficulties in transitioning to green energies mostly due to preserved substantial investments in fossil fuels and the currently enforced low tariff system. (Zhanadilova et al. 2022) The renewables sector also grapples with unstructured relations between producers and operators, ineffective governance structures, and regulatory uncertainties. (Koulouri and Mouraviev 2018) Energy storage challenges, particularly for solar and wind energy technologies, and difficulties in connecting with the existing grid constrain the adoption of renewable energy technologies in Kazakhstan. (Karatayeva et al. 2016) If we add the high initial capital requirements for renewable energy projects, it emerges a framework that discourages investors and developers. (Sitenko et al. 2023)

Overall, these challenges underscore the complexity of transitioning to a green economy in Kazakhstan. Addressing financial constraints and investment attractiveness, improving regulatory frameworks and institutional uncertainties, enhancing public awareness and green cultural values, and tackling sector-specific issues are crucial conditions for fostering sustainable and environmentally friendly practices. Still, the path to sustainability embraced by Kazakhstan seems logical, consistent, and well-structured. As a result, it is possible to look at the ongoing green transition with optimism. A comprehensive set of recommendations is offered here below (Table 2) to mitigate the identified challenges.

Briefly, from a policy perspective, priorities include fostering Research and Development (R&D) for new green technologies, revising ecological taxation, and aligning state purchases with eco-friendly production. From an economic and financial viewpoint, the enhancement of financing mechanisms, sustainable infrastructure investments, and pricing strategies will further boost green initiatives. Support for training programs, improvement of the legal regulatory system for renewable energy, and an increased focus on the development of technologies in strategic areas like energy storage systems, hydrogen potential, and grid modernization would allow Kazakhstan to face its current technological challenges. As for the socio-cultural and educational factors, closing the awareness gap requires comprehensive training programs, curricula reforms in schools and universities, and effective communication strategies to overcome resistance to change. Further details in this regard will be offered in the next sections.

TABLE 2.
CHALLENGES AND RECOMMENDATIONS FOR THE GREEN TRANSITION PROCESS IN KAZAKHSTAN

Type of challenge	Main features	Recommendations
Political and regulatory barriers	- Gaps and inconsistencies in the governance structure raise concerns among investors, leading to setbacks in renewable energy projects and hindering large-scale implementation of green technologies. - Regulatory frameworks lack clarity and comprehensiveness, hindering the growth of renewable energy technologies.	- Launch targeted support for R&D to invent and commercialize new green technologies. - Modify ecological taxation to focus on taxes on activities harmful to the environment and the workforce. - Adjust state purchase policy to support the production of environmentally friendly products.
Economic barriers	- High subsidies for traditional energy sources and low electricity prices constrain the development of renewable energy sources. - Insufficient financing mechanisms and inadequate incentives for investors hinder a large-scale transition to sustainable growth.	- Enhance financing mechanisms for green initiatives. - Ensure state investments in infrastructure and introduce pricing mechanisms that align with sustainable development principles.
Technological challenges	- Development and adoption of renewable energy sources face obstacles such as high initial investment costs, lack of expertise, and resistance to change. - Inadequate infrastructure, unstructured relations, and ineffective governance structures impede the institutionalization of the renewables sector.	- Invest in research and provide support for training green specialists. - Improve the legislative framework to promote the implementation of innovative renewable energy projects. - Focus on technology development in areas like energy storage systems, hydrogen potential, and grid modernization.
Socio-cultural and educational factors	- Limited awareness and understanding of green technologies and practices among the population. - Resistance to change from individuals, influenced by concerns about costs and reluctance to alter established routines. - Need for special programs to equip the workforce with skills for the green economy.	- Implement comprehensive training and capacity-building programs to increase awareness and understanding of green technologies among the population. - Develop communication strategies to address resistance to change. - Introduce green principles and practices in education since childhood
Infrastructure and supply chain constraints	- Inefficient use of resources, inadequate tariff systems, and the absence of an integrated waste management system contribute to environmental degradation. - Limited availability and accessibility of green resources and solutions hinder the full embrace of green technologies.	- Implement centralized state policies supporting research and development (R&D) and innovation to achieve the decoupling effect at the regional level. - Address inefficiencies in resource use, tariff systems, and waste management systems.
Financial and investment challenges	- Lack of financial resources for modernization and implementation of environmental policies. - Limited access to green financing instruments and insufficient investments in green initiatives. - Limited availability of green financial products.	- Develop a clear and transparent regulatory framework for green financing. - Increase awareness of green financing instruments among the population, entrepreneurs, and financial institutions through information coverage and training programs.

3. GREEN JOB MARKET ANALYSIS

3.1 Current state of green employment

The potential for green employment and sustainable development in Kazakhstan is huge. There are various areas of green employment in Kazakhstan encompassing water conservation, sustainable forestry, renewable energy, environmental remediation, sustainability, green buildings, and many others. However, the available academic literature and national reports do not provide detailed information in this regard, only some preliminary reflections. Advanced research and comprehensive data analysis are, therefore, urgently needed in this area.

Some interesting data are, nevertheless, provided by the Kazakhstan Bureau of National Statistics on the web page related to green economy indicators. There were approximately 9 million people officially employed in Kazakhstan in 2022. Figure 3 shows their employment in the main sectors.

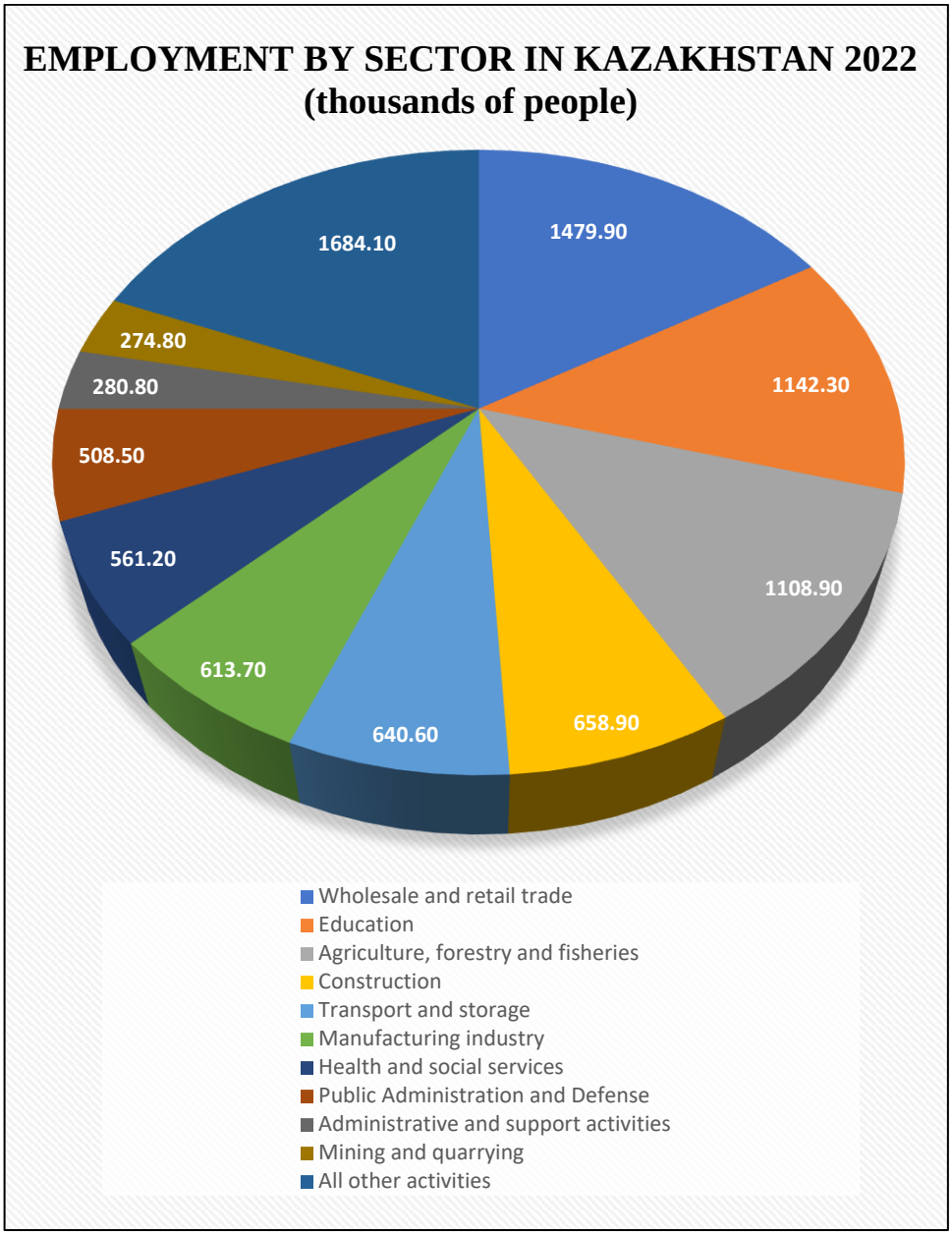

Figure 3. Employment by sector in Kazakhstan in 2022. Source: author, data from the Bureau of National Statistics of Kazakhstan.

Overall, people in Kazakhstan were mostly working in the wholesale and retail trade (~1,480,000 people), education (~1,142,000 people), and agriculture (~1,108,000 people). Industry as a whole (including altogether manufacturing, mining, etc.) counted around 1,121,000 people. According to the data of the Bureau of National Statistics of Kazakhstan (2023), in the year 2022 around 48,895 people worked for medium-sized enterprises in "green jobs" aimed at preserving and restoring the environment. Other 8,608 people worked on similar functions but for small enterprises. However, there is no info on the total amount of employees working in "green areas" in Kazakhstan and neither about their distribution by sector. This lack of information hinders the ability to create thorough and detailed assessments. Fortunately, analyzing additional facts makes it possible to reflect on the current status of green employment in Kazakhstan.

To begin with, the Bureau of National Statistics of Kazakhstan (2023) provides data about the number of people employed at renewable energy facilities in the country. As shown in Figure 4, the number of people employed at renewable energy facilities has progressively grown in the last years, reaching a quota of 1,660 in January 2023. In particular, it is growing the number of people employed in wind farms and solar power plants. Differently, even if hydroelectric is still the renewable energy sector with the largest employment, the trend is in decline. These results are not a surprise as they well reflect Kazakhstan's investments in the renewable energy sector in the last years (on the whole, the number of wind farms and solar power plants is firmly growing, while the amount of hydroelectric power plants is rather steady).

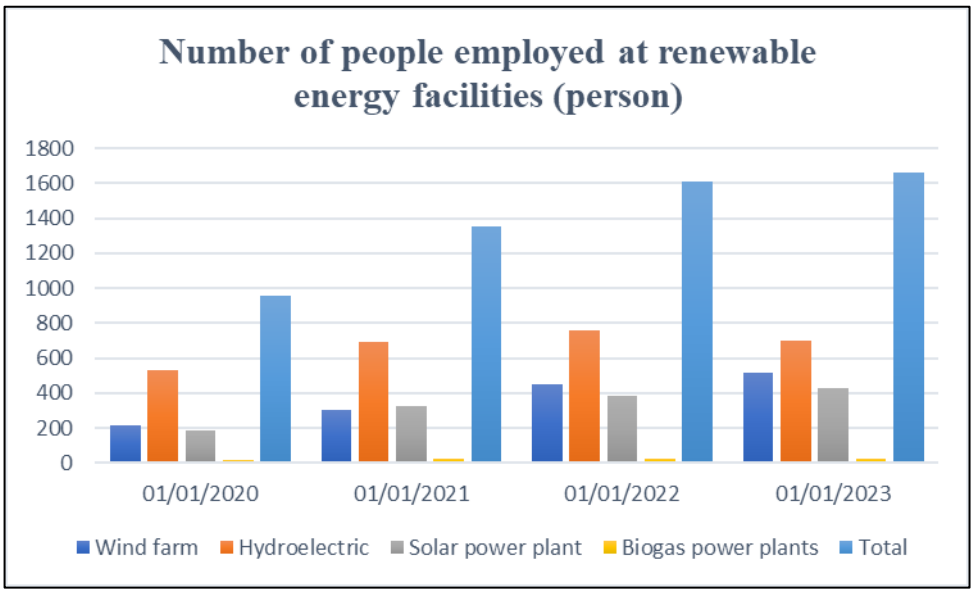

Figure 4. The number of people employed at renewable energy facilities. Source: author, data Bureau of National Statistics of Kazakhstan (2023).

But another interesting fact comes out from this data. Figure 5 shows the gender distribution of people employed at renewable energy facilities. Data clearly shows that the number of men employed in this sector is approximately 6 times higher than the number of women (respectively, 1,402 men and 258 women in the year 2023). However, it shows also three noteworthy factors: first, the number of women employed in renewable energy facilities has grown by almost 60% from 2020 to 2023; second, the number of women working in wind farms has more than doubled in the same period (from 39 to 84 women); and third, in 2023 more women have been hired in renewable energy facilities than men (respectively, 32 women vs. 16). Although the gender gap is still massive, these data could reveal a new trend in the employment system at renewable energy facilities.

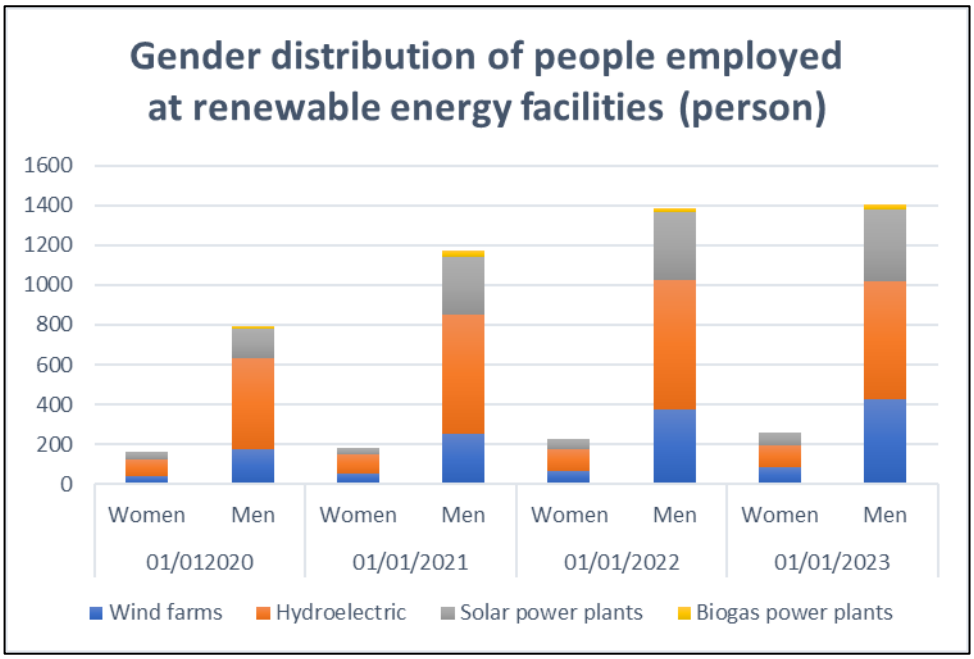

Figure 5. Gender distribution of people employed at renewable energy facilities. Source: author, data from the Bureau of National Statistics of Kazakhstan (2023).

Some interesting insights emerge also from the analysis of the investments aimed at protecting the environment both from the perspective of the economic activity of the investor as well as according to the addressed type of environmental activity. First, the total number of environmental investments in 2022 reached a quota of 159,660,892 thousand tenge, of which 101,010,042 thousand tenge came from domestic investors and 58,650,851 thousand tenge were related to external investors. Figure 6 illustrates that while this amount is less than what was allocated in the previous three years (2019–2021), it is still in line with the investments made in those years and far more than what was invested before to 2019.

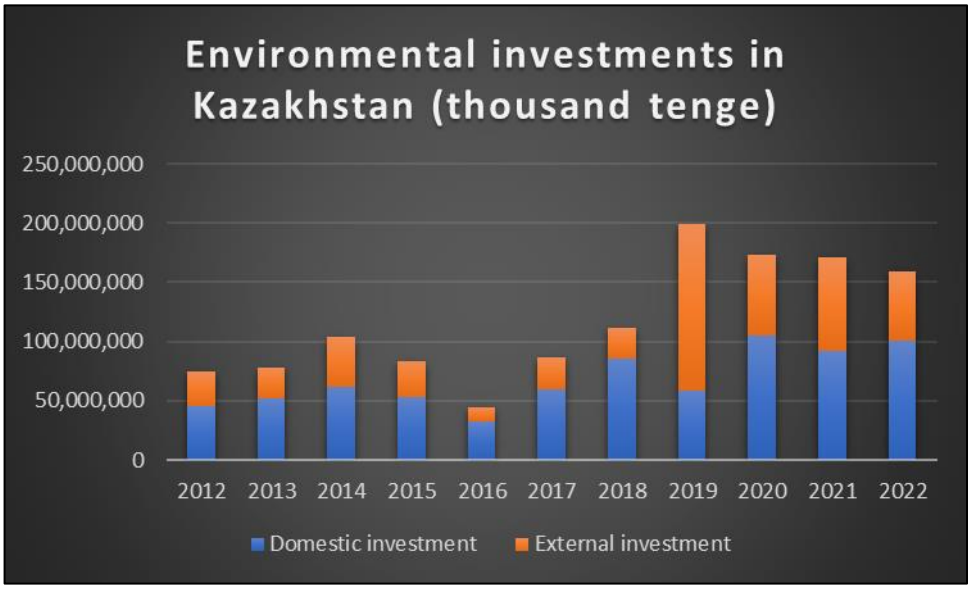

Figure 6. Environmental investments in Kazakhstan: domestic and external. Source: author, data from the Bureau of National Statistics of Kazakhstan.

Second, addressing the investments aimed at protecting the environment by the type of economic activity of the investor as in Figure 7, it comes out that five sectors, mainly industry-related segments, are mostly driving the process (Electricity, gas, steam, and air conditioning; Mining and

quarrying; Manufacturing industry; Construction; Public administration, defense, and compulsory social security).

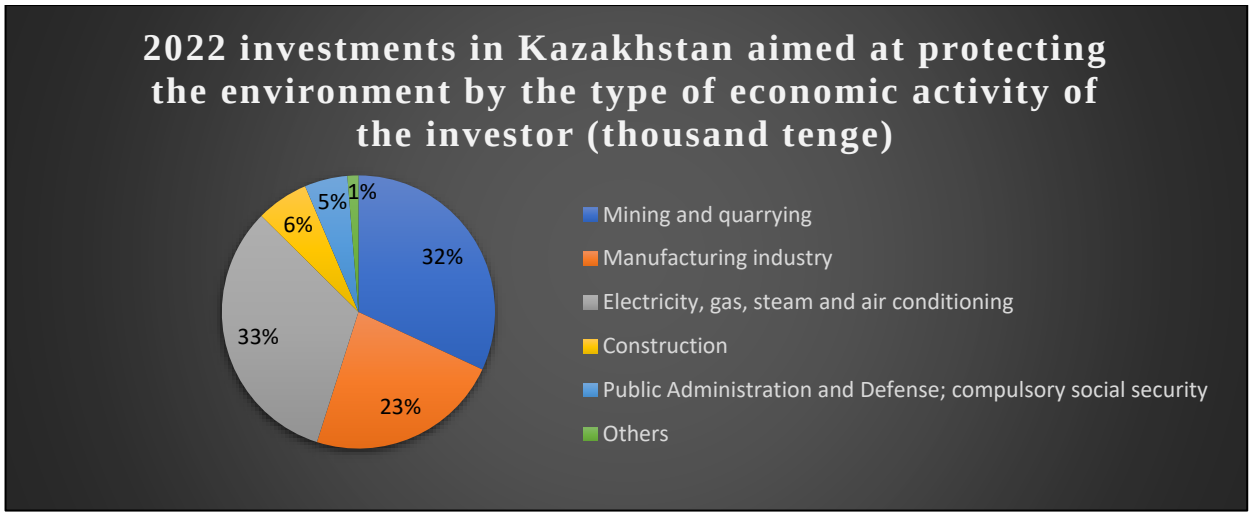

Figure 7. Investments aimed at protecting the environment by the type of economic activity of the investor. Source: author, data from the Bureau of National Statistics of Kazakhstan.

Third, addressing toward which activities such investments were directed, as shown by Figure 8, it comes out that three main areas dominated the scene: 1. Renewable energy investments; 2. Wastewater treatment; 3. Air protection and climate change issues.

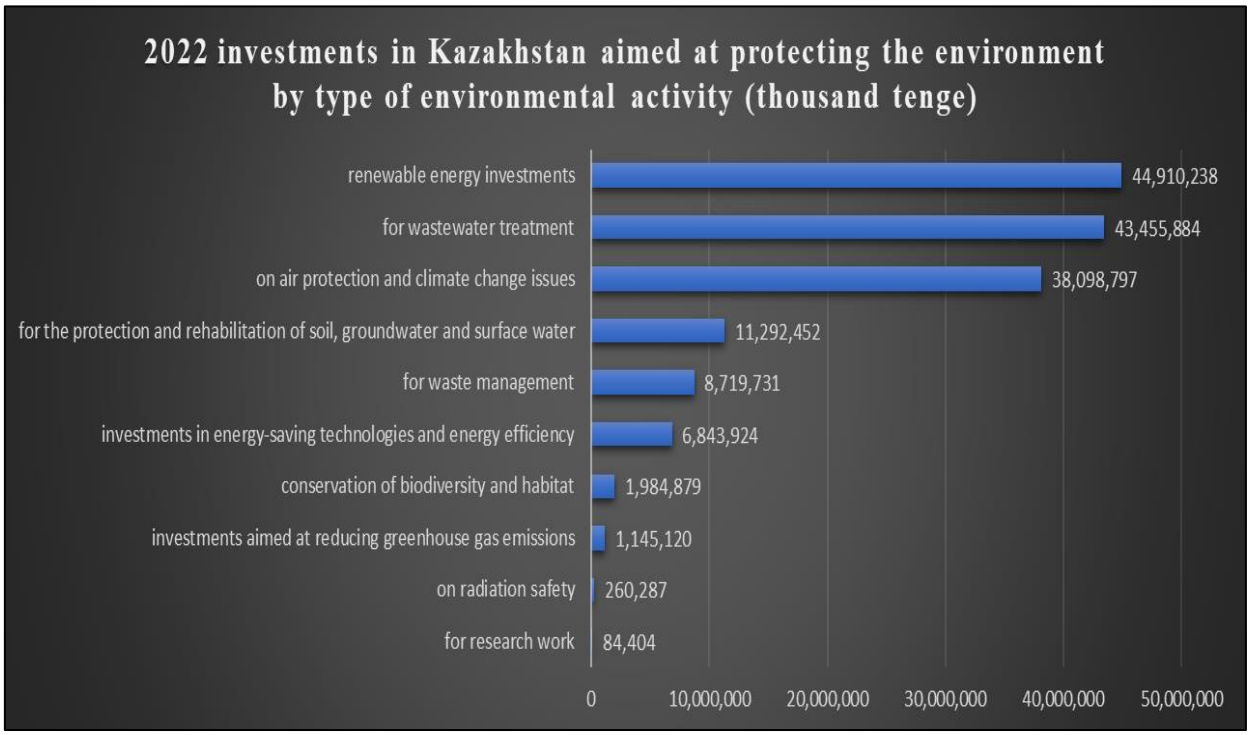

Figure 8. Investments aimed at protecting the environment by type of environmental activity. Source: author, data from the Bureau of National Statistics of Kazakhstan.

What can be deduced from these data is that, in Kazakhstan, there are some sectors – industry, construction, and public administration – in which the level of investments associated with green-related activities – mainly in the frame of renewable energy, wastewater treatment, and air protection/climate change issues – is significantly above average. Plausibly, these are also the business areas in which there should be the highest concentration of green employment in the country.

Two further data are worth mentioning here in this section. As shown in Figure 9, the number of enterprises with environmental innovations in Kazakhstan has to slowly grow again in 2021, after the continuous decline started in 2015.

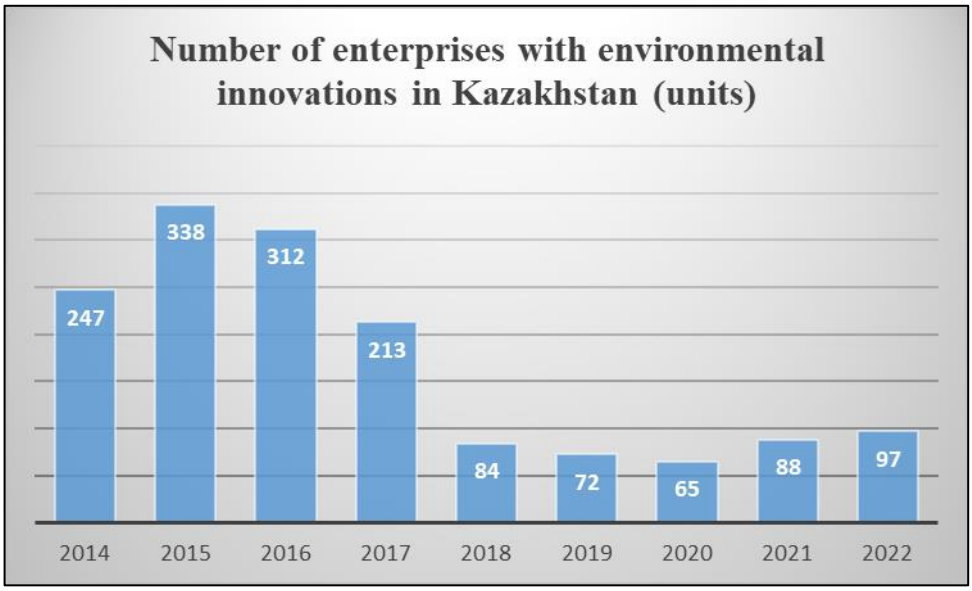

Figure 9. Number of enterprises with environmental innovations in Kazakhstan. Source: author, data from the Bureau of National Statistics of Kazakhstan (2023).

A similar path has been followed by the number of annual patents issued in the field of environmental protection and energy efficiency, as shown in Figure 10. These data suggest that green innovation has regained a positive trend in recent years. The expectations are that such a trend will continue in the years to come, producing an important impact on all those businesses associated with green technologies and innovative practices. Altogether, increased investment in environmental innovations and patents catalyzes job creation across diverse sectors including research and development, technology commercialization, and consultancy.

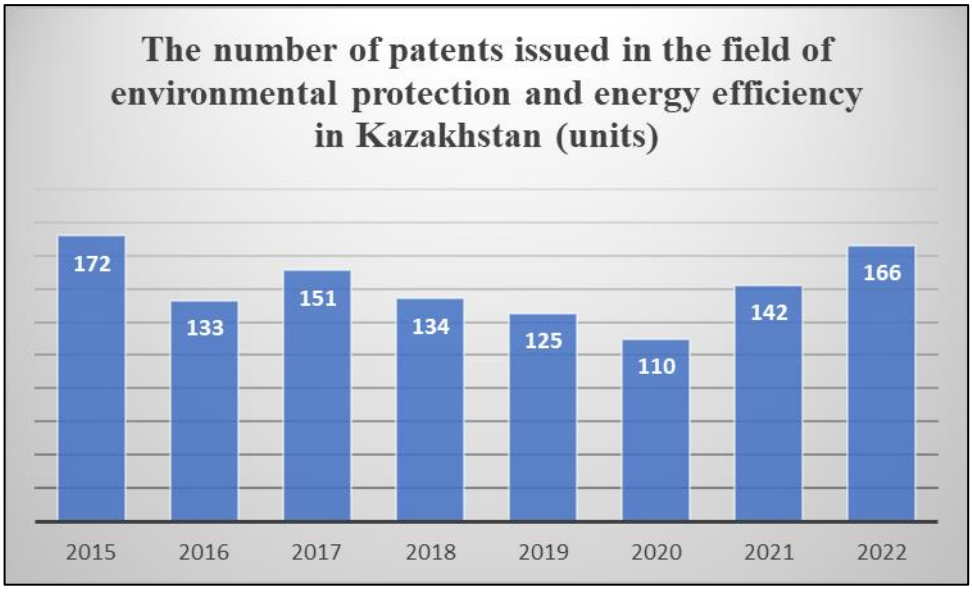

Figure 10. Number of annual patents issued in the field of environmental protection and energy efficiency in Kazakhstan. Source: author, data from the Bureau of National Statistics of Kazakhstan (2023).

3.2 Job types demand and related green skills

Diverse authors in academia have speculated about the upcoming circulation of new job opportunities as a direct result of the green transition process. For example, according to Diyra et al. (2014), the rise of a green economy is expected to create employment opportunities in various sectors that focus on renewable energy, energy efficiency, and sustainable development, while for Mukhtarova and Zhidebekkyzy (2015) new job opportunities are going to emerge within the realms of green construction, agriculture, the energy sector, water management, and recycling.

Still, there are no studies focused on the current state of green job demand in Kazakhstan and their related green skills. This section analyses emerging green occupations and the evolving requirements of conventional professions in Kazakhstan by critically scrutinizing for two weeks in January two prominent recruitment platforms in Kazakhstan – namely LinkedIn and HeadHunter.kz – to find job calls related to green roles. The research has been conducted by using the "green jobs" filter on LinkedIn and trying diverse keyword search combinations like "sustainable development", "green", "sustainability", "natural resources management", etc. The job description and the skills associated with the job post have been then further examined to address if such a job could be considered a dedicated green job, integrated green job, or none of them. The goal is to outline the green skills needed for emerging green professions as well as those in high demand for established occupations.

A total of 21 job postings related to "green jobs" – professions directly or indirectly associated with environmental sustainability and green practices – have been identified in the course of the analysis. The majority of them (18) belong to the "dedicated green jobs" category, as they are professions explicitly designed to address environmental challenges, such as carbon offsets, sustainable energy, water management, and forestry. There are, nevertheless, also a few (3) "integrated green jobs", here referring to those positions where individuals incorporate green skills and sustainability practices into existing professions, making these roles more environmentally conscious without being the primary focus. For example, a financial consultant specializing in green finance and renewable energies or a project manager with expertise in climate change adaptation, environmental policy, and natural resources management. The preponderance of dedicated green jobs could be associated with the rising demand for green specialists in the Kazakh market, but also with the greater technical difficulties in identifying integrated green jobs in the considered portals.

Table 3 provides a sum up of the main findings. Even though these data are limited (e.g. short duration of the assessment, limited number of consulted platforms, and a certain difficulty in identifying green job postings), they provide a partial but significant insight into Kazakhstan's current need for green jobs and skills. Although the reported job types are quite diversified, most of them tend to be related to five main business areas: climate change and carbon reduction; renewable energies and energy efficiency; sustainable water management; natural resources management; and integrated planning and policy making. Overall, the most demanded green skills required in the examined recruiting posts are:

- Natural resources management (5 mentions);
- Environmental law and environmental economics (4 mentions);
- Climate change, environmental management, water resources management, and renewable energy (3 mentions);
- Environment, Health, and Safety (EHS), sustainable waste management, biodiversity conservation, sustainable energy, and sustainable forest management (2 mentions).

TABLE 3.
JOB TYPES DEMAND AND ASSOCIATED GREEN SKILLS IN KAZAKHSTAN

Job type	Business area	Required green skills
Agronomist	Agricultural industry	Agronomic Control climate components Monitoring irrigation strategy
Chemical project technician	Sustainable water management Integrated planning	Environment, Health, and Safety (EHS) Industrial water treatment Environmental law
Chief engineer	Agricultural industry	Register of flora and fauna
Climate change and sustainable energy program manager	Climate change Energy efficiency	Climate change Environmental management Sustainable energy use
Environmental engineer	Natural resources management	Environmental management Environmental law
Environmental specialist	Natural resources management	Environmental law Industry ecology
Expert on modelling the impact of climate change on water resources	Climate change Sustainable water management	Environmental science Hydrometeorology Climate change modelling
Expert in water resources management	Sustainable water management	Transboundary water management Hydrology
Forestry specialist	Forestry	Natural resource management Sustainable forest management
Lead specialist ecology	Ecology	Environmental law and economics Biodiversity conservation
Local partner network for sustainable energy	Renewable energy Energy efficiency	Natural resource management Renewable energy Sustainable energy
Project analyst for carbon offsets	Climate change Carbon reduction	Carbon offsets Conservation issues Environmental economics
Financial analyst for biodiversity projects	Green finance Biodiversity protection	Biodiversity conservation Environmental economics
Project analyst on climate policy	Climate change Policy making	Climate change impacts Climate resilience
Specialist in green cities	Integrated planning	Sustainable transport Green urban planning
Sustainable natural resources management	Natural resources management	Sustainable forest management Natural resources management Land, water and waste management
Sustainable water management	Sustainable water management	Natural resources management Water resources management Sustainable waste management
Technical expert on renewable energy	Renewable energy	Business plans for RES Renewable energy project management
EHS specialist*	Integrated planning	Environment, Health, and Safety (EHS) Environmental management
Financial mechanisms consultant*	Green finance Renewable energy	Renewable energy Green financial mechanisms Environmental economics
Project manager*	Climate change Integrated planning Natural resources management	Climate change Environmental policy Natural resources management

* Careers considered as “integrated green jobs”

To improve the study's comprehensiveness and reliability, the author also examined the experts' responses to two specific inquiries, "What types of green job positions are currently experiencing high demand in Kazakhstan?" and "In the next five years, what green skills are projected to be most in demand in Kazakhstan?" Table 4 sums up the results of this inquiry with local respondents, reporting the most mentioned green jobs and skills.

TABLE 4.
TOP GREEN JOBS AND SKILLS IN KAZAKHSTAN ACCORDING TO EXPERTS

Green jobs	**Number of mentions**
Green tech specialists	5
ESG consulting	4
Clean energy analyst	4
Environmental engineer	4
Sustainability data analyst	3
Sustainability auditor	3
Sustainable water manager	3
Agri-tech specialist	2
Renewable energy specialist/manager	2
Carbon offsets specialist	2
Green policy maker	2
Green skills	**Number of mentions**
Environmental awareness	7
Systemic thinking	5
Renewable energy	5
ESG foundations	4
Sustainability reporting	4
Big data analysis	3
Sustainable mindset	3
Green technical knowledge (applied)	3
Environmental law and regulations	3
Climate change modeling	3
Water management	3

What can be observed from this table is that green tech specialist is the most frequently mentioned green job by respondents, followed by ESG consulting, clean energy analyst, and environmental engineer. Overall, the dominant perception is that knowing how to operate with green technologies is – or is going to be – a fundamental criterion for working in areas like renewable energy, water management, and agricultural production. Second, a growing number of industries in Kazakhstan feel the need to turn green, but they do not know how to practically do it. Therefore, the call for jobs like ESG consulting, sustainability auditor, and carbon offsets specialist is increasing in the market. Third, there is a demand for specialized managers with a comprehensive understanding of legal, socio-economic, and technical aspects related to water reserves, renewable energy, and natural resources. Fourth, due to the complexity of operating with new technologies and in a rapidly developing area, there is going to be a demand for professionals such as clean energy analysts and sustainable data analysts who can collect and analyze complex data. Finally, public institutions will need experts with the capacity to modernize and improve the legal, regulatory, and policy framework in the area of green development and sustainability. Figure 11 sums up the main insights related to the current and expected demand for green jobs in Kazakhstan considering both the data collected from recruiting platforms and the opinions expressed by interviewees.

Figure 11. Demand for green jobs in Kazakhstan considering recruiting platforms and respondents' opinions. Source: author.

Concerning the green skills issue, Figure 12 compares the information collected through the analysis of recruiting platforms and interviewees' answers.

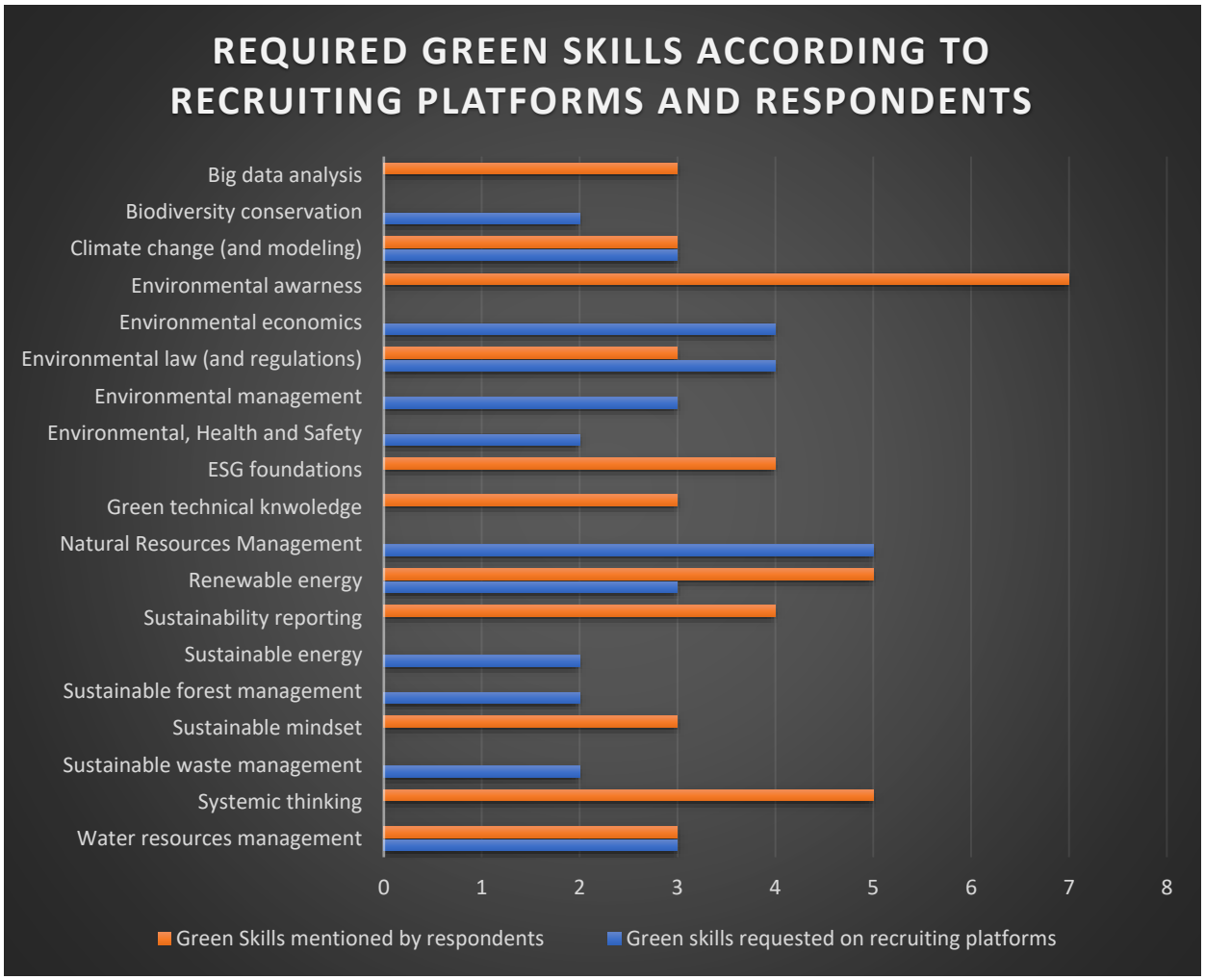

Figure 12. Green skills according to recruiting platforms and respondents. Source: author.

Almost all respondents agree that “environmental awareness” is the core competence to operate in green jobs. They believe that everyone in Kazakhstan should acquire this knowledge through basic education in school and then further extend it in specialized areas during higher education studies. After “environmental awareness”, “systemic thinking” and “renewable energy” are the most mentioned skills. The first is relevant for green managers and policy-makers because it allows for a holistic understanding of interconnected environmental, social, and economic components, facilitating comprehensive and sustainable solutions to complex challenges. The second one is important as the Kazakh government is constantly raising its attention to the development of green energy and energy efficiency. Therefore, being specialized in renewable energy will be highly demanded in the local job market. Unfortunately, a recent study showed that 68% of the world’s energy-focused educational degrees are still dedicated to fossil fuels, while only 32% are more focused on renewable energy. (Vakulchuk and Overland 2024)

Continuing with the analysis, “ESG foundations” and “sustainability reporting” are mentioned by respondents as central skills for those who intend to work in the field of consultancy and audit. But, according to two interviewees, there are currently no courses or professional training in the country to teach how to fill in the related documents according to international standards. Indeed, there is a high possibility of a skill gap in this field. “Big data analysis”, “sustainable mindset”, “green technical knowledge”, “environmental law and regulations”, “climate change modeling”, and “water management” are other green skills cited by at least three respondents. Again, some respondents expressed concerns over the capacity of the Kazakh educational system to cultivate a workforce with such skills in the next future, unless some important changes will not be taken. Interestingly, “climate change”, “environmental law”, “renewable energy”, and “water resources management” are the only four skills regularly mentioned both in the green job posts on recruiting platforms and interviewees' responses. This result is, however, logical and likely given that natural resources management was the business sector with the greatest number of job postings on the recruitment portals.

3.3 Main challenges and recommendations for the green job market

The concept of "green skills" is crucial in the context of the green transition process, as it directly relates to the development of competencies and knowledge necessary for individuals to contribute effectively to environmentally sustainable practices and initiatives. As a result, the impact of green skills on the green transition process is significant in terms of workforce preparedness, technology adoption, and sustainable competitiveness. However, Dlimbetova et al. (2016) highlight the gap in understanding green skills among employers and employees of Kazakhstan, pointing out that while there is a general awareness of these skills, there is an extensive lack of knowledge about the environment-oriented economy. Addressing this lack of awareness and understanding is crucial because, as reported in the LinkedIn Global Green Skills Report 2023, only one in every eight workers has one or more green skills. This data is relevant considering that:

- From 2022 to 2023, the proportion of green talent in the workforce increased by a median of 12.3%, but the proportion of job advertising that needed at least one green skill expanded twice as fast, with a median increase of 22.4%.
- The number of job postings mandating at least one green skill has increased by a median of 15.2% within the same time frame.
- Workers with at least one green talent have a median LinkedIn hiring rate that is 29% greater than the average hiring rate. (LinkedIn 2023)

Indeed, employers need to recognize the importance of green skills not only for environmental reasons but also for their businesses' long-term viability and success. According to interviewees, the main risk in Kazakhstan is to face a lack of renewable energy engineers, green tech specialists, ESG and sustainability auditors, and carbon offset specialists (dedicated green jobs) as well as big data analysts specializing in environmental issues, financial professionals with a focus on green finance, and policymakers with the capacity to conduct systemic analysis in the framework of the green transition (integrated green jobs). Section 4 will examine the state of educational and training programs in Kazakhstan to provide recommendations on how the country could be prepared to address the risk of a green skills gap and box 4.1 will be specifically dedicated to a preliminary assessment of such a gap.

Beyond the risk of a green skills gap, there are two factors negatively affecting the assessment of the green job framework in Kazakhstan. First, there is not a clear, well-articulated, and publicly recognized definition of “green jobs” in Kazakhstan. Without a clear definition of "green jobs," there is ambiguity about which occupations and industries contribute directly to environmental sustainability. A precise definition is, therefore, crucial for identifying and categorizing jobs that have a positive impact on the environment. This clarity helps guide policy initiatives, training programs, and investment strategies towards sectors that actively support the green transition. Moreover, a well-defined concept of green jobs provides a foundation for understanding the skills and competencies necessary for these roles, emphasizing their significance in the workforce. In this regard, recognizing the existence of dedicated green jobs and integrated green jobs is essential for informed decision-making, targeted skill development, effective policy implementation, and the overall success of the transition toward a more sustainable and environmentally conscious economy. For example, recognizing dedicated green jobs allows for strategic planning of the workforce in sectors specifically designed to address environmental challenges, while the integration of green practices into existing occupations ensures that sustainability principles are applied across various industries.

Second, there is not at the national level an effective “green jobs” monitoring system. A monitoring system for green jobs is essential to track the growth and impact of environmentally sustainable employment. Without such a system, it becomes challenging to assess the success of green initiatives, measure the effectiveness of policies, and identify areas that require additional support. Monitoring helps policymakers maintain updated statistical information, make informed decisions, and allocate resources efficiently in support of the green economy. Furthermore, a monitoring system for green jobs enables the identification of trends in the demand for specific skills within the green sector. This information is valuable as it facilitates the alignment of education and training programs with the evolving needs of the green job market, ensuring that individuals are equipped with the right skills for employment in environmentally sustainable sectors.

On the whole, three structured actions might be implemented to enhance the green job market in Kazakhstan and address the above-mentioned gaps.

1. Update the 2013 “Concept for the Transition to Green Economy” by:
    - Providing a clear definition of green jobs and differentiating between dedicated green jobs and integrated green jobs;
    - Developing a comprehensive, transparent, and renewed policy framework – grounded on specific goals, targets, and timeframes – to outline the government's commitment to a green economy;
    - Establishing regulatory measures and incentives to encourage businesses and industries to adopt green practices.

2. Support an impactful public communication campaign on the meaning and value of green jobs by:
    - Utilizing a mix of communication channels (e.g. traditional media, online platforms, community events, etc.) to reach different stakeholders (e.g. general public, businesses, educational institutions, etc.);
    - Emphasizing tangible economic benefits and environmental gains that can positively impact Kazak people, communities, and industries;
    - Placing the notion in context through a series of case studies and narratives that highlight local success stories, thus making the idea more approachable and compelling.
3. Measure and classify green jobs and their related skills according to specific methodologies and tools:
    - Establishing data collection mechanisms that leverage advanced analytics and tracking systems. Diverse sources such as labor market data, industry reports, and surveys can be used to gather information. However, the data collection methods must be standardized and consistent over time for accurate trend analysis.
    - Aligning measurement methodologies with international standards and frameworks, such as those established by the International Labour Organization (ILO) and the United Nations Environment Programme (UNEP). Adhering to globally recognized standards facilitates cross-border comparisons, benchmarking, and the exchange of best practices.
    - Creating a feedback mechanism involving key stakeholders to gather input on the effectiveness of the measurement methodologies and tools. Likewise, conducting periodic reviews of the methodologies and tools to incorporate emerging trends, technologies, and industry developments.

4. EDUCATIONAL ENVIRONMENT AND GREEN SKILLS

4.1 The state of green educational and training programs

Education and training are indispensable processes for cultivating a sense of environmental responsibility and providing individuals with the knowledge, competencies, and attitudes demanded in the green job market. Different authors have stressed the importance of enhancing and developing educational programs and professional training in Kazakhstan with a focus on green skills. (Diyra et al. 2014; Mukhtarova and Zhidebekkyzy 2015; and Dlimbetova et al. 2016) To assess the matter, this section focuses on three key elements: first, the state of higher educational programs focused on environmental protection; second, the rise of higher educational programs aimed at substantially integrating green skills in their curricula; third, the development of specialized "green training programs" for professionals working in diverse fields.

Concerning the first element, data from the Bureau of the National Statistics of Kazakhstan (2023) reveal interesting facts. Overall, as shown in Figure 13, the expenditures on scientific and technical projects related to the "green economy" have progressively increased in recent years. This data can be interpreted as a sign of the Kazakh government's interest in fostering a gradual green transition in the country. This interpretation seems confirmed by the fact that, in 2022, the number of licenses issued in the field of environmental protection has almost doubled compared to the previous year, reaching a quota of 297. (Bureau of the National Statistics of Kazakhstan 2023)

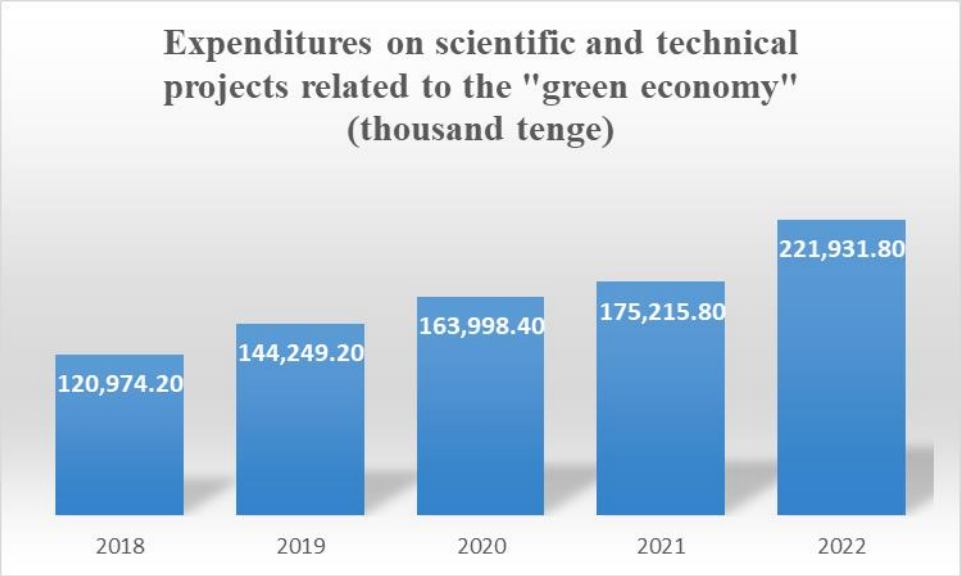

Figure 13. Expenditures on scientific and technical projects related to the "green economy" in the period 2018-2022. Source: author, data Bureau of National Statistics of Kazakhstan.

However, as shown in Figure 14, the number of graduates in environmental specialties in Kazakhstan from 2010 to 2022 followed a sinusoidal waveform, but without significant variations in the total numbers: the lowest point was the year 2017 with 2,182 graduates, while the highest peak was in 2020 with a total of 3,180 graduates. After the peak of 2020, there has been a decline in the number of graduates in environmental professions: only 2,498 people completed their studies in 2022. This data is surprising considering that 2,798 people already completed their environmental studies in 2010 in a framework characterized by a much lower emphasis on sustainability and environmental responsibility. Likewise, the share of graduates in environmental professions for the year 2022 compared to the total number of graduates of higher educational institutions is rather constrained: only 1.5%. "Life safety and environmental protection" has taken

the place of "ecology" as the most popular specialty in Kazakhstan with a total of over 1,000 graduates in 2022. The number of students completing "water resources and water use" and "land management" programs tend to be quite stable with around 250 graduates per year. Differently, the program in "Forest Resources and Forestry" got an important increase in the number of students completing it in the period 2018-2021, but such a trend changed in 2022 with the number of graduates declining from 502 to 316. Of course, environmental specialties are just a niche within the sphere of "green specialties". Nevertheless, these data are significant because they show that the number of students completing studies in these areas is still quite constrained notwithstanding the attention raised by local, national, and international authorities over the environmental issues. Further studies should examine the reasons behind such results.

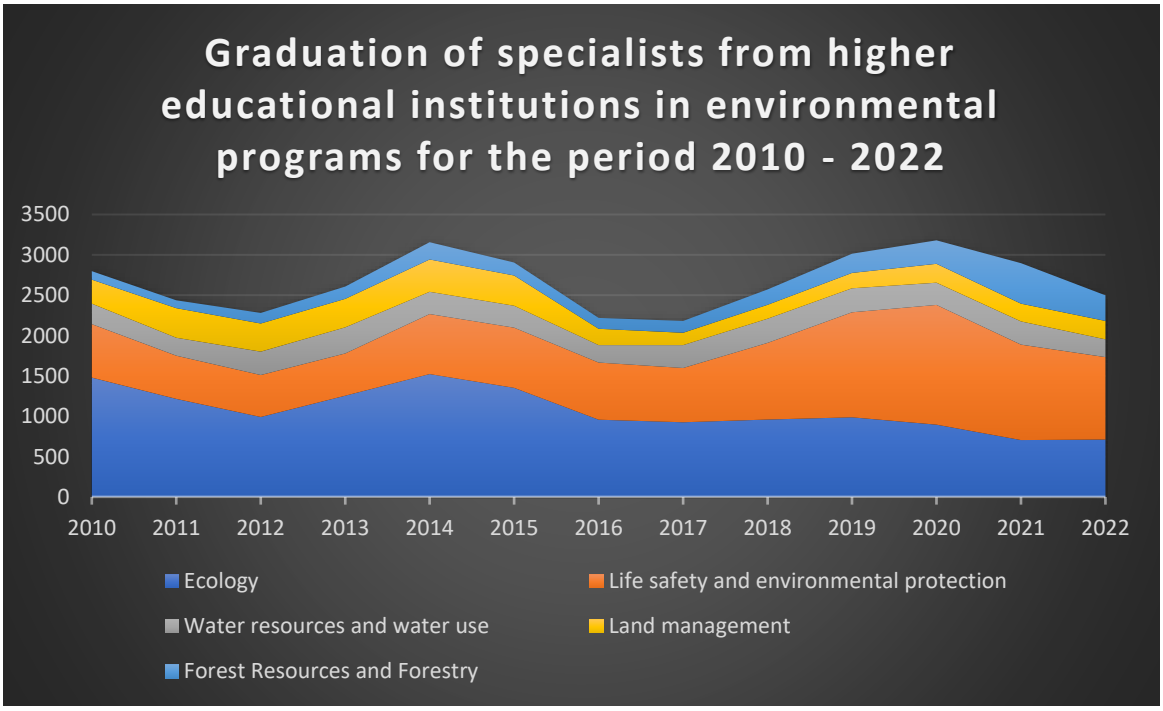

Figure 14. Graduation of specialists from higher education institutions in environmental programs, period 2010-2022. Source: author, data Bureau of National Statistics of Kazakhstan.

Concerning the second element, several universities in Kazakhstan are progressively integrating sustainability and green skills development in their curricula and educational activities. A comprehensive assessment of such a trend is beyond the scope of this report. Here the attention will be exclusively focused on some of the most successful practices adopted by a list of selected universities that have gained recognition for their efforts both at national and international levels.

Almaty Management University (AlmaU), one of the first private universities in Kazakhstan, has recently developed multiple initiatives to raise its focus on sustainability and social responsibility. For instance, the program "International Relations and Economics" provides a module on "Civil Society and Sustainability", which includes a total of five dedicated courses, including a course in "Sustainable Development: Principles and Practice" and another one in "Sustainable Economics". Likewise, AlmaU students of management have nowadays courses such as "Introduction to Sustainable Mindset" and "Corporate Social Responsibility and Sustainable Development" among their compulsory subjects. Some of these courses entail practical activities in cooperation with local NGOs, while others are designed as global signature courses, thus requiring interactions with faculty members from other countries of the world. Through these courses, students can gain knowledge in the areas of green thinking, civil society, and circular economy; develop specialized skills such as sustainable project development, fundraising, and complex problem-solving; and

foster fundamental values like civic responsibility, sustainability, and eco-centric perspective. In addition, the AlmaU Center for Sustainable Development and ESG cooperates with Lehigh University (USA) in the realization of students' projects related to areas such as sustainable education for schools, air pollution, and sustainable food production and consumption. Overall, they are valuable opportunities for students to enhance green skills through experiential learning.

Kazakh-German University (DKU) is emerging in the Kazakh educational market as the leader in the field of sustainable management, with three noteworthy Master's programs in "Integrated Water Resources Management", "Strategic Management of Renewable Energy and Energy Efficiency" and "Sustainable Business Development Management". On the whole, such programs support the spreading of green skills in areas like sustainable business management, strategic and innovative management, environmental law and economics, water resources management, energy saving and energy efficiency, renewable energy, and others. Beyond that, DKU has been proactively engaged in hosting a variety of events and activities including training on renewable energy, energy transition, and energy efficiency for young Central Asian women; a 5-day training on the clean energy transition course; a summer school on the Aral Sea with a focus on thematic areas such as archaeology, geomorphology, and hydrology; and diverse visits to renewable energy sites aimed at allowing students and researchers to better understand technical operations and challenges characterizing solar, wind and hydroelectric power plants.

Kazakh National Agrarian Research University (KazNARU) has launched a Green Campus Programme aimed at both introducing sustainable practices at the campus as well as creating new green educational programs in the university curricula. The idea is that the university must "lead by example", thus acting as a living laboratory for sustainability and civic responsibility. For example, students and faculties jointly identified and planted inside and outside the campus flowers, bushes, and trees with the highest capacity to effectively absorb heat and air pollution considering the framework of Almaty city. Moreover, they supported the development of a recycling system within the university and the formation of new sustainable development programs. Today, KazNARU is one of the leaders in agricultural and natural resources management in Kazakhstan and its programs comprehensively integrate green innovation and practices.

Nazarbayev University (NU) coordinated learning initiatives, applied projects, and green campus activities to foster a sense of commitment toward the green mission within the whole university. On the whole, this approach is grounded on three main pillars. First, the NU Green Campus project was launched in 2016 to promote a sense of respect for the environment. The activities of the project are performed by the Green Campus office in cooperation with the NU Green Society, a student organization with more than 60 students. In 2019, the Office initiated a Sustainability Living Lab initiative to assist faculties and students in implementing green projects and raising environmental awareness within its community. Second, in January 2022, the Sustainable Development Solutions Network (SDSN) Kazakhstan was approved as a national network hosted by the Graduate School of Public Policy of Nazarbayev University. SDSN Kazakhstan intends to promote long-term solutions for the sustainable development of Kazakhstan by supporting education and research cooperation as well as proposing applied research and policy initiatives. Third, NU is progressively introducing educational initiatives centered on the "green factor". Some examples are the MSc program in "Civil and Environmental Engineering" and the workshop on "Sustainability in Natural Resource Management: Exploration, Extraction & Processing, and Supply Chains of Critical Raw Materials".

To sum up, the development of green skills in higher education institutes of Kazakhstan is, nowadays, grounded on a progressive integration of green skills in traditional curricula, the development of special programs with a focus on technical green skills, the promotion of experiential learning activities through projects and field trips, and the creation a green campus as a living laboratory to experiment sustainable solutions. Table 5 critically assesses the actions taken by the examined universities and their impact on the promotion of green skills.

TABLE 5.
ACTIONS OF THE KAZAKHSTAN HIGHER EDUCATION INSTITUTIONS TO PROMOTE GREEN SKILLS

Type of action and case study	Impact
Integrating green skills in traditional education and organizing students' projects related to green areas. Almaty Management University (AlmaU)	• Advocacy for Sustainability: Hands-on projects create environmentally conscious individuals who actively promote sustainable practices. • Community Engagement: Green projects involve collaboration with local communities, fostering beneficial partnerships. • Fostering Innovation: Green projects encourage creativity and problem-solving, preparing students for real-world environmental challenges. • Holistic Education: The interdisciplinary nature of green skills integration provides a comprehensive understanding of environmental issues.
Introducing innovative green programs and organizing specialized training and field trips. Kazakh-German University (DKU)	• Cutting-Edge Education: Introducing innovative green programs ensures students receive up-to-date knowledge and valued skills. • Experiential Learning: Field trips and specialized training provide hands-on experience, enhancing understanding and application of theoretical concepts in actual environmental settings for real-world challenges. • Industry Relevance: Keeping programs aligned with industry trends ensures graduates are well-prepared and competitive in the job market. • Networking Opportunities: Working with green businesses creates networking opportunities, connecting students with professionals and organizations in the sustainability sector.
Spreading a green thinking approach through the development of a green campus. Kazakh National Agrarian Research University (KazNARU)	• Sustainable Mindset: Involving students in the development of a green campus fosters a sustainable mindset, instilling values of environmental responsibility and consciousness. • Community Building: The participation of students in the decision-making process ensures a sense of ownership and commitment to green initiatives, creating a more engaged and proactive campus community. • Hands-On Learning: The process of developing a green campus provides students with hands-on learning experiences in sustainable design, construction, and maintenance. • Role Modeling: A green campus serves as a model, inspiring other institutions and communities to adopt sustainable approaches.
Coordinating teaching, projects, and green campus activities to foster a reinforced system of green skills development. Nazarbayev University (NU)	• Integrated Approach: coordinating learning initiatives, applied projects, and green campus activities establishes a comprehensive integration of sustainability and green skills development, thus fostering a deep sense of commitment within the whole community. • Student Engagement: The direct engagement of students not only empowers them with applied green projects but also nurtures leadership skills, creating a generation of environmentally conscious leaders. • National and International Collaboration: the creation of hubs for national and international collaboration contribute to long-term solutions for sustainable development in Kazakhstan and beyond. • Role Modeling: A green campus serves as a model, inspiring other institutions and communities to adopt sustainable approaches.

Beyond the case studies considered here above, other universities in Kazakhstan are following similar approaches and practices. Satbayev University, for example, proceeded with extensive integration of SDG principles within its curricula and recently opened the "Center for Sustainable Development". Following a slightly different approach, Narxoz University redesigned its main campus with a green perspective, introduced specialized green courses like "Ecology and Sustainable Development", and established the "Sustainable Kazakhstan Research Institute," which directly engaged the local mining industries in the identification and enforcement of environmentally friendly solutions against pollution. Therefore, even though it is still in its infancy, there is a growing "green trend" among several Kazakhstani universities to support the development of innovative activities aimed at fostering green skills in their institutions and progressively enhancing their educational programs. Nevertheless, some local institutes lack the resources (e.g. financial, human, and/or infrastructural) and/or the willingness to embrace such a change. As a result, developing a cohesive and inclusive higher education system in Kazakhstan requires strengthening the cooperation between universities as well as opening a direct dialogue with other stakeholders (e.g. industries, public institutions, and civil society organizations).

BOX 4.1 – THE GAP BETWEEN GREEN JOBS AND HIGHER EDUCATION IN KAZAKHSTAN

This box section seeks to study the availability of specialized educational programs (master's degrees) related to some of the most demanded green jobs identified in the previous chapter. This preliminary assessment reveals that, notwithstanding some relevant improvements reached in recent years, there is still a notable gap between the burgeoning demand for green jobs and the current landscape of higher education offerings in Kazakhstan. Even if part of this gap is covered by vocational education and special training, there is still a great deal of work to be done to "green" the higher education system.

THE GAP BETWEEN GREEN JOBS AND HIGHER EDUCATION IN KAZAKHSTAN

Green Jobs in Demand	Available Education in the Area	Missing Educational Aspects
Renewable Energy Engineers	Master in "Strategic Management of Renewable Energy and Energy Efficiency" at DKU.	Master in Renewable Energy Engineering.
Green Tech Specialists	Masters in "Agricultural Machinery and Technology"; "Water Resources Management Using IT-Technologies"; and "Biotechnology" at KazNARU.	Courses in: Clean energy technologies and applications. Energy storage systems. Green building and infrastructure design.
ESG/Sustainability Auditors	Master in "Environmental Management and Audit" at Atyrau University.	Courses in: Sustainability reporting. ESG risk management and compliance.
Carbon Offsets Specialists	-	Courses in: Carbon footprint assessment. Carbon markets and trading.
Data Analysts Specialized in Environmental Issues	Masters in "Water Resources" at DKU and Satbayev University. Master in "Civil and Environmental Engineering" at NU. Master in "Forest Resources and Forestry" at KazNARU	Master in Environmental Data Science (for instance, with courses in GIS for environmental analysis; machine learning for environmental science; and environmental data analysis and visualization).
Financial Experts with a Focus on Green Finance	-	Master in Finance with a focus on "Green Finance" (for instance, with courses in green bonds; climate finance; and socially responsible investments).
Green Policymakers	Master in "Sustainable Business Development Management" at DKU. Master in "Sustainable Development" at KazNU.	Master in Public Administration with a focus on "Sustainability" (for instance, with courses in climate change policy; environmental economics; and environmental law).

Concerning the development of professional green training, there are three main institutions in Kazakhstan operating in this sector: Qazaq Green Association, Green Academy, and the NJSC "International Green Technologies and Investment Projects Center". As claimed on its official website, Qazaq Green Association is a non-profit organization launched in 2018 with the objective of 'promoting renewable energy in Kazakhstan, green economy principles and contributing to the achievement of carbon neutrality by uniting investors, developers, equipment manufacturers, international financial institutions, and universities.' (Qazaq Green Association 2023) Among its activities, the association organizes educational and training courses in the field of renewable energies since 2023. The "RES School Qazaq Green" is a 3 days intensive seminar for government officials, corporate executives and employees, eco-activists, and students in the area. The main goal of the seminar is to give a basic introduction to renewable energy sources and how to green existing businesses in Kazakhstan. Specifically, the course provides an understanding of the laws and policies supporting renewable energy in Kazakhstan, technical information about how to build RES facilities, and recommendations on the financial modeling of renewable energy projects as well as on investments in carbon offsets. In 2024, the institution launched the voluntary standard "Qazaq Green Certificate Program", aimed at supporting companies in achieving carbon neutrality in Kazakhstan through an independent verification and validation system.

Green Academy is a think tank organization, founded in 2013, whose main aim is to create informational support for Kazakhstan's transition to a "green" economy and contribute to the growth of decision-makers, executives, and all those who wish to contribute to the sustainable development of the country. From an educational perspective, Green Academy organized training in the field of "green" economy, "green" business, LEED/BREEAM international standards, carbon trading system, and eco-marketing for representatives of government bodies, national companies, and businesses. Nowadays, the company does not provide such training anymore, but it offers consulting support on diverse environmental issues and it is also responsible for the implementation of an independent certification system for specialists in the greenhouse gas validation and verification industry. Moreover, it regularly organizes seminars, roundtables, and workshops on themes related to climate change.

The Non-profit Joint Stock Company "International Green Technologies and Investment Projects Center" was created by the government of the Republic of Kazakhstan in 2018 to promote green technologies and support businesses to increase the level of the economy's competitive ability, improve living standards, and reduce environmental contamination. At times, the institution organizes some special projects to foster the green transition in Kazakhstan. For instance, in 2023 the company launched the "Global Program for Promoting Innovations in the Field of Clean Technologies and Entrepreneurship in SMEs to Create Green Jobs in Kazakhstan" (known as GCIP-Kazakhstan) to identify bright entrepreneurs in Kazakhstan and assist them with ongoing coaching, training, and networking opportunities.

ESGQ is a rating agency that was established in 2022 and is considered to be one of the first in this field for Central Asia. Its primary objective is to offer advisory services to enterprises in several areas, including but not limited to screening, non-financial reporting, and sustainable development strategies. In addition, this institution of learning provides a training program that is designated as "Sustainable Business Development and ESG Fundamentals" with modules related to the political economy of the climate agenda, sustainable development risk management, sustainable green finance, non-financial ESG reporting, and ESG ratings.

As a result, a few Kazakhstani institutions are already providing valuable professional training in green areas (Table 6). There is also a growing network among training centers, local industries,

and academic experts. Even if, the training offer is constrained at the moment, more opportunities will likely grow in the coming years. Considering the main limits, most of the initiatives take place only in a few cities – mainly Almaty, Astana, and Atyrau – thus uncovering the whole territory of Kazakhstan. Likewise, training programs are available in a few selected green areas, while others (e.g. agriculture, cultural heritage management, IT, transportation, and tourism) are not part of advanced training yet. Moreover, there are no mechanisms aimed at boosting the completion of internationally recognized certificates from Kazakhstan and/or ensuring specific standards of quality in the offered local training. Finally, there is a growing, but still restricted response to the lifelong learning principle in Kazakhstan. In other words, the number of persons who are willing and able to re-train in green sectors remains limited.

TABLE 6.
INSTITUTIONS IN KAZAKHSTAN PROVIDING PROFESSIONAL TRAINING COURSES IN GREEN AREAS

Institution	Areas of professional training
Qazaq Green Association	• Renewable energy technology • Renewable energy policy and legislation • Renewable energy management • Carbon offsets
Green Academy	• Green economy • Green business • LEED/BREEAM international standards • Carbon trading system • Eco-marketing • Independent certification for specialists in the greenhouse gas validation and verification industry
NJSC International Green Technologies and Investment Projects Center	• Green technologies • Green entrepreneurship
ESGQ	• Sustainable business development • Sustainable green finance • ESG reporting and ratings

4.2 Gaps and barriers hindering the development of green skills

According to the information presented in the last section, Kazakhstan is gradually introducing a variety of green education and training programs. Such a trend is promising as it allows green skills to spread throughout the population and helps to support the process of making a smooth transition to a green economy. However, based on the literature available (e.g., Dlimbetova et al. 2016; Zhilbaev et al. 2022; and Minazhova 2023) as well as the opinions expressed by interviewees, there are still numerous gaps and barriers hindering the spread of green skills in Kazakhstan at present. A schematic illustration of these challenges is presented in Table 7, which divides them into three different categories: willingness to learn, accessibility to learning, and quality of available learning opportunities.

TABLE 7.
GAPS AND BARRIERS HINDERING GREEN SKILLS IN KAZAKHSTAN

Category	Challenge	Description	Recommendation
Willingness to learn	Gap Between Youth and Society's Expectations	The demand for highly qualified specialists capable of effectively addressing sustainability issues remains unmet.	Addressing this gap requires initiatives to instill a sense of responsibility and commitment to sustainability issues among the youth.
	Limited Understanding of Green Skills	Employees' limited understanding of green skills reflects a lack of willingness to engage with environmentally conscious practices.	Fostering awareness campaigns and educational programs is essential to cultivate a willingness to learn and adopt green skills.
	Resistance to Change	Most of the respondents claim that among Kazakh people there is a diffused resistance to changing and learning new skills due to a conservative mentality and cautious approach.	Focusing attention on the target audience is a priority to determine what they want, how to best meet such a need, and what kind of benefits they can achieve through learning green skills.
Accessibility to learning	Lack of Awareness Among Employers	Employers' lack of awareness hinders their willingness to integrate green skills training into the personal development programs of their workforce.	Initiatives aimed at raising awareness among employers about the benefits of green skills are crucial to overcoming this barrier.
	Lack of Emphasis on Green Competencies and Environmental Values	The absence of emphasis on green competencies and environmental values in formal education systems highlights a lack of accessibility to relevant learning opportunities.	Modernizing educational content to integrate green competencies and sustainable development goals into formal education is an essential step to enhance accessibility to foundational green skills.
	Insufficient Training and Professional Development Programs	The gap between the demand for green skills and available training opportunities points to a lack of accessibility to comprehensive learning programs.	Policymakers and institutions must collaborate to bridge this gap, enhancing the accessibility of training and professional development opportunities.
Quality of the available learning opportunities	Insufficient Systematic Approach	The absence of a systematic approach to greening vocational and professional education suggests a lack of quality in the strategic integration of green skills.	Policymakers must adopt a comprehensive strategy to ensure the systematic and high-quality integration of green competencies
	Fragmented Quality Education	Notwithstanding the remarkable cases mentioned in the previous section, green skills development is still too fragmented and sectorial.	Coordinated initiatives among higher education institutions could compensate for internal knowledge gaps and offer exhaustive training.
	Weak Experiential Learning	Few apprenticeship programs involve practical learning experiences related to environmental sustainability and green skills development.	A structured collaboration between universities and business companies would provide individuals with hands-on experience and skills development in green practices.

Addressing the gaps and hurdles impeding the development of green skills in Kazakhstan necessitates a diversified strategy. Initiatives should focus on creating a sense of responsibility and commitment to sustainability concerns among youths, as well as promoting awareness campaigns and educational programs to increase knowledge and motivation to learn green skills. Moreover, overcoming opposition to change demands specific solutions aimed at promoting the personal benefits associated with green skills development while taking into account the general population's conservative mindset and cautious approach.

Improving accessibility entails increasing employer knowledge of the positive impacts of green skills, incorporating green expertise into formal education, and closing the gap between demand and available training options via joint efforts by governments and institutions. Along the same lines, ensuring the quality of learning opportunities necessitates a systematic approach to greening education, establishing coordinated activities across higher education institutions, and encouraging experiential learning through structured collaboration between universities and industries.

Therefore, a comprehensive action plan is required to eliminate these obstacles and create a conducive environment for the effective development and adoption of green skills in Kazakhstan. The next section would offer a cohesive, consistent, and structured set of recommendations to achieve such a goal.

4.3 Action plan to foster green skills in Kazakhstan

Taking into account the information collected in this report and the recommendations offered by the interviewees, the following action plan – schematically represented in Table 8 – has been developed to foster the spread of green skills in Kazakhstan and prepare the country to address the rising demand for green jobs.

To increase Kazakhstani’s willingness to learn green skills, the following tasks need to be accomplished:

- Organize campaigns for public information to raise awareness about the advantages and prospects of working in the field of renewable energy and other green arenas. Due to the need to target a diversified audience, various channels of communication including events, publications, and social media should be employed in the process. Securing support from influential community leaders and well-known public figures would increase the capacity to endorse the importance of green skills and expose the positive outcomes associated with embracing green practices.
- Develop an *ad hoc* national online platform dedicated to green jobs in Kazakhstan. Such a platform might have an informative function aimed at communicating clear career growth paths and competitive salaries for individuals pursuing green skills, as well as a job search function, by acting as a meeting point for recruiters hiring in green sectors and green professionals searching for employment.
- Establish community-based learning centers to bring education closer to individuals in a familiar setting. To address cultural sensitivity these centers should emphasize how green skills complement and enhance traditional knowledge rather than replace it. Additionally, they should be able to conduct qualifying exams to award certificates indicating employees' green skills.

To increase the accessibility to learning opportunities in green areas, the following tasks need to be accomplished:

- Establishing recognition programs and incentives to acknowledge those companies that are investing in green training might convince employers to support green development programs for their workforce as well as stimulate the adoption of green business practices. Linking green skills to enhanced job prospects, financial incentives, or community recognition could further motivate the participation of employees in green professional training activities. Entailing a recognition of green skills in the National Qualifications System (NQS) of Kazakhstan would foster this process.
- Integrating sustainability principles and green skills among the compulsory learning outcomes of schools and higher educational programs would ensure the spread of fundamental green knowledge and values among all youths studying in Kazakhstan. Supporting the creation of specialized educational programs and courses focused on technical green areas like, for example, renewable energy, environmental economics, and agro-tech would enhance the capacity to generate green specialists in diverse regions of Kazakhstan.
- Promoting the centers for training currently operating in the country and collaborating with existing educational institutions and industry experts to design and deliver effective training programs in areas uncovered, at present, by the market could foster the development of advanced green skills in Kazakhstan. In this framework, endorsing alternative entry and re-entry pathways to making green skills training accessible to a diverse range of individuals, including women, job seekers, and vulnerable groups is a desirable scenario.

To increase the quality of the available learning opportunities, the following tasks need to be accomplished:

- Engaging learners with hands-on, active participation in environmental issues through innovative experiential learning would ensure a deeper knowledge of green practices as well as an enhanced understanding of technical green skills. Integrating practical experiences into the curriculum aligned with industry requirements would also bridge the gap between academic learning and practical skills.
- Encourage the participation in and completion of internationally recognized green training and certification programs, such as Certified Renewable Energy Professional (REP), GRI Professional Certification, and International Society of Sustainability Professionals (ISSP) by providing incentives for individuals who attain these certifications. This measure would support the creation of a group of highly qualified local specialists as well as the adoption of international standards in green skills training.
- Create a database of technical green experts in Kazakhstan and establish a consortium of universities, training centers, NGOs, and green companies that might collaborate in the development of comprehensive high-quality educational and training programs. Creating a systemic structure of cooperation within a consortium will make it possible to fulfill individual institutional gaps and build holistic interdisciplinary educational and training programs with opportunities for qualitative experiential learning.

TABLE 8. ACTION PLAN TO FOSTER GREEN SKILLS IN KAZAKHSTAN		
Issue	**Key Recommendation**	**Solutions**
Low willingness to learn	Promote environmental ideals and disseminate information about the advantages of working in green fields	Organize information public campaigns using diverse channels of communication and influential leaders. Develop an *ad hoc* platform dedicated to green jobs in Kazakhstan. Establish community-based learning centers with the capacity to award green certificates.
Accessibility to learning	Support and increase the educational and professional programs contributing to the development of green skills	Establish a system of public recognition and incentives for companies investing in green skills and include green skills within the National Qualifications System (NQS) of Kazakhstan to foster the process. Make sustainability principles and green skills compulsory learning outcomes for schools and higher educational programs, plus support the creation of specialized educational programs focused on technical green skills. Promote the centers for green training currently operating in the country and support the creation of new centers for uncovered green areas.
Quality of the available learning opportunities	Introduce innovative teaching approaches and methodologies that would make learners ready for the green job market	Encourage experiential learning by integrating hands-on experiences into the curriculum and fostering partnerships between universities and green enterprises Support the completion of internationally recognized green training and certification programs. Create a database of "green experts" and establish a consortium among institutions interested in the development of green skills.

Table 9 provides a risk assessment framework – with references for mitigating or preventing these risks – for the recommendations provided in the action plan for fostering the spread of green skills in Kazakhstan.

TABLE 9. RISK ASSESSMENT FRAMEWORK		
Recommendation	**Risk Description**	**Mitigation/Prevention**
Public information campaign to raise awareness	Resistance or lack of interest from the public	Conduct thorough research and audience analysis to tailor messaging. Engage with community leaders and public figures to secure support and endorsements.
Develop an online platform dedicated to green jobs	Lack of funding or resources	Secure funding through public-private partnerships. Collaborate with NGOs for implementation support.
Establish community-based learning centers	Resistance or lack of support from local communities	Engage local communities in the planning and design process. Emphasize the benefits of green skills while incorporating traditional knowledge and values.
Establish recognition programs and incentives for green training	Lack of awareness or buy-in from employers	Launch awareness campaigns to highlight the benefits of green training for businesses. Offer financial incentives or tax breaks for companies investing in green training.
Integrate sustainability principles and green skills into educational curricula	Resistance from educational institutions or challenges in curriculum integration	Provide training and resources for educators on integrating sustainability principles. Develop pilot programs to demonstrate the effectiveness of green curriculum integration.
Promote training centers and collaborate with educational institutions and industry experts	Lack of collaboration and/or diverse approaches	Foster collaboration through partnership agreements and memorandums of understanding.
Engage learners with hands-on, active participation in environmental issues	Limited resources or infrastructure for implementing hands-on learning experiences	Seek funding from government grants or private partnerships to invest in necessary resources and infrastructure for hands-on learning activities.
Support for participation in internationally recognized green training and certification programs	Lack of awareness or accessibility to international certification programs	Provide information and guidance on available certification programs. Offer scholarships or grants for program participation.
Create a database of technical green experts and establish a consortium of universities, training centers, NGOs, and businesses	Resistance or lack of interest from potential collaborators	Engage stakeholders through targeted outreach and communication. Clearly define roles and responsibilities within the consortium to ensure effective collaboration.

5. CONCLUSIONS

The state of the green transition in Kazakhstan reflects commendable progress marked by legislative measures, policy frameworks, and economic mechanisms geared towards a sustainable future. Undeniably, multiple areas require attention and certain barriers still need to be broken. Nevertheless, Kazakhstan's commitment to sustainability suggests that its efforts are on track for positive environmental and economic outcomes. Overall, to proceed with a consistent and cohesive green transition Kazakhstan has to keep updated its legal system, enhance its green policy framework, and implement effective measures to attract green investments, secure funds, spread awareness among the public, strengthen education, and support capacity building.

Notwithstanding the lack of statistical data, a rising attention toward green jobs is evident. Sectors such as renewable energy, integrated planning, and natural resources management are already demanding green specialists and other businesses are likely to follow such a trend. The analysis of green employment figures indicates substantial potential, notably in sectors like green tech, ESG consulting, sustainability auditing, and holistic management, mostly for water and energy resources. And yet, despite some relevant improvements reached in recent years, there is still a concerning gap between, on one side, the potential demand for green jobs and their related skills and, on the other, the current landscape of higher education offerings in Kazakhstan. Moreover, other challenges persist, including conceptual ambiguity, a diffused illiteracy about green skills, and the absence of systemic mechanisms to track information about the green jobs' framework. Therefore, the top priorities are to provide a national reference to fundamental concepts like "dedicated green jobs", "integrated green jobs", "green skills", etc., and build a mechanism to regularly collect standardized data on the state of green jobs employment in Kazakhstan as well as feedback from the diverse stakeholders involved in the process.

The existing educational and training programs, while showing promising outcomes and interesting trends, exhibit vulnerabilities in alignment with the evolving needs of the green job market. A comprehensive action plan is proposed in this report to address these challenges. First, to promote environmental ideals and disseminate information about the advantages of working in green fields it is recommended to organize information public campaigns using diverse channels of communication and influential leaders, develop an *ad hoc* platform dedicated to green jobs in Kazakhstan, and establish community-based learning centers with the capacity to award green certificates. To support and increase the educational and professional programs contributing to the development of green skills, Kazakhstan should introduce and implement a series of multi-layered interventions such as introducing a system of public recognition and incentives for companies investing in green skills, making sustainability principles and green skills compulsory learning outcomes for schools and higher educational programs, supporting the creation of specialized educational programs focused on technical green skills, promoting the centers for green training currently operating in the country and support the creation of new ones for uncovered green areas. By cohesively implementing these cohesive actions, Kazakhstan can bridge the green skills gap, align education with the workforce's real skill demands, and propel its green transition toward a sustainable and prosperous future.

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7. ANNEXES

ANNEX 1. RESPONDENTS TO THE SEMI-STRUCTURED INTERVIEWS		
ACADEMIA		
NAME AND SURNAME	UNIVERSITY	FOCUS AREA
Aurora Diaz Soloaga	Almaty Management University	• Management • Education • Sustainability
Maiya Suyunchalieva	Kazakh National Agrarian University	• Agriculture • Innovation • Sustainability
Larissa Kogutenko	Kazakh-German University	• Water management • Hydrometeorology • Sustainability
Gulzhanat Gafu	Nazarbayev University	• Ethics • Education • Sustainability
BUSINESS		
NAME AND SURNAME	INSTITUTION	FOCUS AREA
Dmitriy Pak	EPAM Systems	• ESG • Social impact and inclusion • Sustainability
Dana Shukirbayeva	Forest Hero	• Climate tech • Green entrepreneurship • ESG consulting
Nailya Mussayeva	Green Academy (part-time consultant)	• Consultancy • Business development • Sustainability
Danara Mukasheva	Qazaq Green Association	• Project Management • Education • Renewable Energy Sources