

"Energy efficiency-2025" policy and human capital development: scientific and theoretical analysis

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Abstract. This article analyzes the role of human capital in professional development from a scientific-theoretical and legal point of view in the context of the "Energy Efficiency-2025" policy. Based on scientific literature and reports of international organizations, human capital is considered a decisive factor in economic growth and innovative development. Based on the analysis of national programs and international conventions on ensuring energy efficiency in Uzbekistan, legal mechanisms for supporting human capital will be considered. The article also put forward practical proposals for ensuring the development of human capital.

INTRODUCTION

In today's complex and competitive global economy, the long-term development potential of states is primarily determined by the level of human capital. Human capital is the main strategic resource of socio-economic development, including knowledge, skills, experience, health, work culture, and social activity of the individual. According to scientific sources, not only physical capital, but also investments in human capital play a decisive role in achieving sustainable economic growth [1].

Today's technological transformation, digitalization, and automation processes are introducing radical changes to the labor market. This has further increased the importance of professional development in human capital. In the modern economy, professional development is emerging not only as a factor of personal growth but also as a fundamental condition for ensuring national stability, transitioning to an innovative economy, and maintaining competitiveness. The process of digitalization and digital transformation also affects the spheres of public administration [2; 34].

At the same time, the development of human capital is inextricably linked with the energy efficiency of the country. In particular, the "Energy Efficiency-2025" policy being implemented in Uzbekistan defines as a strategic task the training of specialists with personnel potential, energy audit, energy management, "green" technologies, and innovative competencies. International research also emphasizes that the increase in energy efficiency is directly related not only to technological resources, but also to highly qualified human capital.

This article comprehensively analyzes the scientific and theoretical principles of professional development in human capital, the role of human capital and the system of competencies in the processes of ensuring energy efficiency, as well as practical reforms in Uzbekistan, national regulatory framework and international legal experience. On this basis, the interrelationship between the development of human capital and energy efficiency policy is scientifically and theoretically substantiated, and practical proposals are put forward.

EXPERIMENTAL RESEARCH

The concept of human capital was introduced into scientific circulation in the second half of the 20th century by economists Theodor Schulz and Gary Becker and became one of the central categories of modern economic theory. In their research, human capital is defined as a strategic resource consisting of an individual's knowledge, skills, qualifications, health, and social experience, directly affecting labor productivity and economic efficiency [1-2]. From

this point of view, expenditures on education, professional development, and healthcare are considered as investments in economic growth and social stability.

While Schultz (1961) emphasized that investments in human capital significantly increase labor productivity, Becker (1964) assessed this process as one of the main drivers of long-term economic growth. In their opinion, human capital is a strategic resource for the state, business, and society, the development of which stimulates innovation processes and ensures a competitive advantage in the modern economy [3].

Professional development manifests itself as a practical expression of human capital, ensuring that the individual regularly updates their knowledge and skills, acquires new competencies, and adapts to technological changes in the labor market. In today's global economy, the increasing proportion of highly qualified specialists in such areas as IT, artificial intelligence, digital services, and the "green economy" determines the level of innovation potential and energy efficiency of the country.

International organizations also emphasize the strategic importance of human capital and professional development. In particular, OECD reports highlight that a systematic approach to professional development is a crucial factor in ensuring not only economic efficiency but also social stability and equal opportunities [4]. In conditions of rapid technological changes, updating skills and retraining are considered one of the most effective mechanisms for maintaining the value of human capital.

These scientific approaches are closely related to the "Energy Efficiency-2025" policy. Reforms in the field of energy efficiency - energy audit, energy management, resource-saving technologies, "green" innovations - cannot be effectively implemented without highly qualified personnel. Thus, professional development in human capital is a necessary condition for increasing energy efficiency, and scientific literature confirms that national energy policy is closely linked to investments in human capital.

In conclusion, human capital and professional development are the main drivers of energy efficiency, an innovative economy, and sustainable development. Therefore, investment in human capital and improvement of the professional development system are of decisive importance in the "Energy Efficiency-2025" policy.

RESEARCH RESULTS

Legal and Regulatory Framework in the Republic of Uzbekistan. In recent years, the development of human capital has become one of the priority directions of state policy in Uzbekistan. The resolution of the President of the Republic of Uzbekistan dated 02.12.2022 №RP-436 "On Measures to Improve the Effectiveness of Reforms Aimed at Transitioning the Republic of Uzbekistan to a "Green" Economy by 2030" [5] approved the Program for the Transition to a "Green" Economy and Ensuring "Green" Growth in the Republic of Uzbekistan until 2030. With this program, sustainable and efficient use of natural resources; strengthening the resilience of the national economy to natural disasters and climate change; ensuring the "green" and low-carbon development of the national economy, in particular industry; introducing innovations and attracting effective "green" investments; developing sustainable and inclusive "green" urbanization; Such a priority area as supporting the population and their places of residence, which may be most affected during the transition to a "green" economy, has been identified.

The effective implementation of the tasks in these priority areas provides for the implementation of such tasks as increasing the potential for "green" growth and developing human capital.

The process of ensuring "green" development in public administration and the economy, increasing energy efficiency, and developing human capital are inextricably linked, and the formation of mechanisms aimed at increasing comprehensive institutional and cognitive potential in this area is of great importance.

Firstly, the development of strategic management, planning, and analytical competencies of managerial personnel of state bodies and organizations is one of the main conditions of modern sustainable management. To this end, it is necessary to conduct special training for the heads of interested ministries and agencies on sustainable development and efficient resource management.

Secondly, technological competencies and practical skills are important in the implementation of the processes of transition to a "green" economy, and the organization of practical and technical training for middle-level employees of the public and private sectors will have a positive effect. This includes, in particular, education on climate resilience, energy saving, and environmental innovations.

Thirdly, the formation of a coaching corps in the field of "green" growth and the introduction of a system for training special instructors for scientific institutions will ensure the translation and regular updating of knowledge. Short-term, practice-oriented curricula are an important tool in this area.

Fourthly, it is necessary to introduce a mechanism for allocating small grants to stimulate the development of "green" knowledge and consulting services in the private and non-commercial sectors. This ensures the improvement of environmental awareness and skills of the public through the organization of open lectures, scientific and practical conferences, and seminars.

Fifthly, the integration of green economy topics in the education system, especially in higher and vocational education, serves the formation of sustainable development competencies. The inclusion of topics related to environmental innovations, resource conservation, and energy efficiency in existing curricula will improve the quality of personnel training.

Sixthly, the creation of a national information platform for the "green" economy - an online center - will allow for the collection of legislation, international experience, and analytical data in this area in one place. This is an important infrastructure for users to access fast, reliable, and systematized information.

Finally, the creation of a research fund for "green" development will lay the foundation for institutional support for scientific research in the field of environmental innovations, green technologies, and sustainable growth.

In general, all these areas serve to strengthen human capital as a strategic resource in the development of energy efficiency and a "green" economy.

Article 43 of the Constitution of the Republic of Uzbekistan guarantees the rights to education and labor. In addition, equality in this sphere is ensured through the Law "On Education," the Labor Code (2023), and a number of state programs.

Vocational education and equal opportunities are also specifically defined as one of the UN Sustainable Development Goals (SDG 4 and SDG 8).

Human capital and professional development in international legal documents. Convention No. 142 of the International Labour Organization (ILO) (1975) is the legal basis calling for the continuous implementation of vocational education and professional development in all countries.

UNESCO's "Education 2030" program prioritizes the formation of professional knowledge and skills as the basis of human capital [6].

The "Education in the Middle Ages" programs adopted in the countries of the European Union and the OECD guarantee the right of people to lifelong learning. This is an important legal tool in ensuring human rights and equal opportunities.

Table 1. Main directions of professional development in human capital

№	Direction	Summary
1	Increasing scientific potential	Through professional development, a person acquires new technologies and knowledge
2	Competitiveness in the labor market	Professional skills ensure adaptation to market needs
3	Social mobility	Advanced professional experience contributes to personal and career growth
4	Economic efficiency	Human capital plays a crucial role in productivity and economic growth
5	Legal guarantees and equal opportunities	Professional development allows every citizen to develop

The directions shown in the table further illuminate the crucial role of professional development in human capital for the progress of society and the state. Enhancing scientific potential, adapting to the labor market, social mobility, economic efficiency, and legal guarantees - all of these serve to fully realize human potential.

Strategic importance of rational human capital-oriented policies and reforms. Rational policies and effective reforms aimed at human capital create a solid foundation not only for personal development processes but also for the long-term progress of the entire country [7]. As emphasized in the analyses of international organizations such as the World Bank, the UN, and the OECD, investments in human capital are the most important source of economic growth in the 21st century and the primary driver of global competitiveness.

Human capital should occupy a central position in determining the strategic development directions of the state [8]. This is because healthy, knowledgeable, and highly skilled human resources ensure an innovative economy, technological advancement, and social stability. For instance, the experiences of Singapore, South Korea and Finland demonstrate that prioritizing human capital has enabled these countries to transition to industrial and post-industrial stages within a short period.

The aforementioned scientific and legal analyses clearly illustrate the strategic importance of professional development in human capital. This process exerts influence in two directions: 1) at the micro level - individual professional growth, adaptation to market demands, and improvement of work efficiency; 2) at the macro level - enhancement of national economic competitiveness, socio-economic stability, and strengthening of the state's standing in the global arena.

Through professional development: stability is ensured in the national economy, as highly qualified personnel play a leading role in the efficient use of resources, optimization of production processes, and implementation of new technologies; an equal competitive environment is formed in the labor market. This increases social well-being, creates equal opportunities for youth and various social strata; and paves the way for social justice, personal growth, and mobility. In this case, people gain the opportunity to obtain high-paying jobs through knowledge and skills, and social mobility mechanisms function effectively.

Thus, a rational policy focused on human capital is the main criterion for the strategic stability of the state and the comprehensive development of society. It should be implemented through the modernization of the education system, improvement of professional training, and implementation of the principle of lifelong learning [9, 10].

The following table of analyses is compiled based on international organizations and scientific sources, comprehensively illustrating the socio-economic impacts of human capital policy at both macro and micro levels.

Table 2. Impacts of human capital policy at macro and micro levels

Level	Main directions	Effects of influence
Macro level	Ensuring economic growth and competitiveness	Through the implementation of innovations and technologies, GDP growth rates will increase, and the national economy will develop sustainably.
	Stability in the labor market	The increase in a highly skilled workforce reduces unemployment rates and enhances labor productivity.
	Social stability	Economic inequality will decrease, while social justice and prosperity will strengthen.
Micro level	Professional growth	The adaptability of an individual to labor market demands and their work efficiency increase.
	Income and social mobility	Thanks to knowledge and skills, opportunities for obtaining high-paying jobs will expand.
	Personal development and satisfaction	Psychological satisfaction, social engagement, and enhanced quality of life are ensured.

CONCLUSIONS

Based on this, within the framework of the "Energy Efficiency-2025" policy, stimulating professional development in human capital and providing institutional support for it emerges as one of the primary tasks. This is because ensuring energy efficiency, green technologies, and sustainable economic growth directly relies on human resources with high qualifications and modern skills.

Firstly, it is advisable to widely implement the public-private partnership (PPP) model in reforming the personnel training system for the energy efficiency and "green economy" sectors. Through this mechanism, it will be possible to develop training programs based on practical needs in areas such as energy, renewable energy sources, and resource-saving technologies. As a result, personnel training will quickly adapt to the requirements of the real sector, and the role of human capital in increasing energy efficiency will be strengthened.

Secondly, to legally ensure the development of human capital, it is necessary to reinforce the right to professional development and advanced training in the field of energy efficiency with institutional guarantees in the Labor Code of the Republic of Uzbekistan. The right of citizens to update their knowledge and skills in new technologies, resource-saving work methods, "green" skills, and environmental responsibility during their work activities should be defined as a specific legal norm.

Thirdly, based on global experience, it is advisable to introduce a professional certification system in the field of energy efficiency and "green" technologies, as well as to develop educational credit mechanisms. This will reduce financial barriers for citizens in obtaining specializations in high-tech fields and form qualification standards recognized in the labor market. This system will become an important factor, especially in the training of energy auditors, energy managers, "green" engineers, and resource efficiency experts.

In conclusion, the effective implementation of energy efficiency policy is closely linked to improving the quality of human capital. Legal, institutional, and financial support for professional development serves as the main foundation for ensuring the country's sustainable energy policy, economic growth, and social well-being. Every reform implemented within the framework of the "Energy Efficiency-2025" strategy plays an important role in ensuring not only economic efficiency but also social stability and innovative development.

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