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Comparative analysis of regulatory requirements in the construction industry of the USA and Kyrgyzstan: approaches to ensuring safety and quality of facilities

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A B S T R A C T :

This article examines the regulatory requirements in the construction industries of the United States and Kyrgyzstan. It explores approaches to ensuring the safety and quality of facilities, and mechanisms for control and certification in construction. A comparative analysis of the regulatory systems of the two countries is conducted, highlighting differences in licensing, inspections, and risk management. Particular attention is given to existing challenges, such as the need to modernize Kyrgyzstan's regulatory framework and introduce international standards. Recommendations are provided to improve the regulatory system of Kyrgyzstan's construction industry with a view to raising the safety, quality, and sustainability of infrastructure.

Keywords: regulatory requirements, construction industry, safety, quality, licensing, certification, risk management, USA, Kyrgyzstan.

1. Introduction

The construction industry holds an important place in the socio-economic development of any country, as it facilitates the creation of essential infrastructure and real estate. The effective functioning of this sector is impossible without adherence to regulatory requirements designed to secure the safety and quality of constructed facilities. These requirements are shaped by historical, economic, and cultural factors unique to each country. Listed factors make the analysis essential for identifying effective approaches and potential areas for improvement.

The U.S. has highly developed construction industry and exemplifies an extensive approach to the development and implementation of regulatory standards. Through decades of experience and active involvement of autonomous organizations, the country has established robust legal systems aimed at protecting construction quality and safety. This renders the U.S. a great case study, particularly in the context that it can successfully adapt regulatory methods to suit contemporary challenges. Conversely, the construction industry in the Kyrgyz Republic is undergoing change with a focus on how to modernize its regulatory system. The country seeks to include international standards in consideration of its own national context.

In its present development level, Kyrgyzstan's construction industry has some serious problems to overcome. The primary among them is the outdated regulatory framework, a major portion of which is inherited from the Soviet period. The meager resources devoted to quality control and the half-way implementation of international standards of modern times are other impediments to effective regulations. The issue of ensuring the seismic resistance of buildings is very serious, given the high tectonic activity in the region. The United States experience in developing and implementing innovative regulatory approaches offers lessons for Kyrgyzstan. The aim of this study is to offer a comparative overview of regulatory requirements in the United States and Kyrgyzstan construction sectors.

2. Main part. Analysis of legislative approaches in the U.S. and Kyrgyzstan

The construction industry holds an important place in securing sustainable development, as the quality of regulatory frameworks directly impacts the safety, reliability, and durability of infrastructure projects [1]. Effective legislative measures are essential for overseeing all stages of construction. It varies from design and material selection to operation and eventual decommissioning of buildings. Regulatory legislation regarding the choice of building materials, technologies, licensing, certification procedures, and state oversight procedures is of utmost importance to the process.

The U.S. is distinguished by a comprehensive, multi-layered system of building control which integrates federal codes, state code, and local codes. At the federal level, key documents involve:

- International Building Codes (IBC), developed by the International Code Council (ICC), which establish unified standards for construction practices. While the IBC is not legally mandatory, most states and municipalities adopt it as a foundation for their local regulations;
- The Code of Federal Regulations (CFR), comprising environmental and building-related standards, like those set out by the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA);
- The Fair Housing Act and the Americans with Disabilities Act (ADA), which mandate building accessibility standards to accommodate individuals with limited mobility and guarantee equitable access to facilities.

At the local and state levels, the code system is supplemented by local codes to meet special climatic, seismic, and socio-economic conditions. California has stringent seismic resistance requirements as mandated in the California Building Code, which has elaborate provisions for building design to withstand seismic forces [2]. In northern states such as Washington, energy efficiency of buildings is the priority. The Washington State Energy Code establishes prescriptive minimum energy efficiency standards for new buildings [3]. These include maximum thermal transmittance values for building envelopes and energy use limits for various types of buildings.

In the Kyrgyz Republic, constructional legal basis is based on the legislation formed during Soviet times that has later been adjusted according to modern conditions. The principal regulatory documents include:

- The Urban Planning Code of the Kyrgyz Republic, which governs zoning, design, and construction activities;
- Construction Norms and Regulations (SNiP), partially inherited from the Soviet Union and supplemented within the framework of national policy;
- Laws and subordinate acts, such as the Law on Licensing, which regulates the procedures for obtaining permits for construction and design activities.

Compared to the U.S., Kyrgyzstan's legislative base is not territorially diversified due to the centralized type of regulation. National standards must often be revised to achieve international requirements, particularly in seismic resistance and energy efficiency.

In the U.S., licensing of builders, designers, and contractors is strictly state-dependent and controlled. Professional boards award rights, and qualification examination passage and verification of professional experience are part of the process. Kyrgyzstan has centrally controlled licensing through the Ministry of Architecture, Construction, and Housing and Communal Services, which makes the process easier but results in fewer variations in regulatory techniques.

The American control system is implemented with governmental inspections and independent certification bodies that are nationally accredited. Periodic checking of works in construction to guarantee adherence to building codes is mandatory. Government checks ensure control of the process of construction in Kyrgyzstan. The independent certification mechanism remains underdeveloped.

The construction regulatory environment in the U.S. is characterized by its multi-level nature, high adaptability, and independent organization participation. Kyrgyzstan requires further modernization of its regulatory base and implementation of international standards [4]. These differences provide a foundation for developing recommendations to improve the national regulatory system for construction.

2.1. Safeguarding standards in construction

Ensuring construction works quality and safety is one of the industry's top priorities because it directly affects human lives, infrastructure strength, and economic efficiency of projects. Different countries employ different mechanisms and tools to achieve these purposes. They can be tailored to their own natural, economic, and social conditions.

In the U.S., construction project quality and safety are guaranteed at every stage, ranging from design to completion. Among the primary aids to the achievement of this is the International Building Code (IBC), which has thorough requirements for seismic resistance, fire safety, and building energy efficiency. Organizations such as the American Concrete Institute (ACI) and the American Society of Civil Engineers (ASCE) also develop institutional technical norms to address specific aspects of construction (table 1).

Table 1 - Examples of material-specific standards for conventional construction materials with large market share [5].

Material	Organization	Standard
Structural concrete	**American Concrete Institute (ACI)**	**ACI 318: Building Code Requirements for Structural Concrete and Commentary**
Structural steel	**American Institute of Steel Construction (AISC)**	**AISC 360: Specifications for Structural Steel Buildings**
Cold-formed steel	**American Iron and Steel Institute (AISI)**	**AISI S100: North American Specification for the Design of Cold-Formed Steel Structural Members**
Wood	**American Wood Council**	**National Design Specification for Wood Construction**

In the U.S., there are stringent requirements for building material certification. Every production batch of concrete, steel, and other key materials must meet certain standards, which are tested in the laboratory. Compliance tests are regularly conducted by government agencies and independent testing organizations to demonstrate compliance with the building codes. The process of inspection comprises the preliminary review of project plans and site verification during the time of construction.

Regulation in Kyrgyzstan is primarily carried out on the basis of SNiP and GOST governing design, materials, and construction technologies. While most provisions remain valid, certain of them are outdated and require updating. Principal material certification is formal but often denied the effectiveness of being efficient by insufficient resources to handle extensive quality control. State inspection in Kyrgyzstan tends to be aimed at the later phases of construction, i.e., commissioning of buildings. Control in the initial phases of design and construction is generally lacking because of the absence of sufficient qualified personnel and sophisticated monitoring equipment. Risk assessments are conducted periodically, and seismic resilience is a matter of extremely high importance since the region is extremely tectonically active.

Overall U.S. standards are typically updated from time to time to reflect technological and scientific advances to render them current. Kyrgyzstan publishes updates less frequently, making regulatory measures less effective. Risk analysis in the United States is included in all stages of construction, significantly minimizing the risk of accidents. In Kyrgyzstan, control over risks is conducted piecemeal.

2.2. Recommendations for improving the regulatory framework in Kyrgyzstan

The construction industry of the Kyrgyz Republic is also critical, with such things as an aging legislative and regulatory system, insufficient capacity to control quality, and poor integration of international norms. There are requirements for both short-term and strategic measures to solve them. The American experience, with its multi-layered system of regulation, involved independent organizations, and functioning risk management systems, is an exemplary case to redesign the construction regulation in Kyrgyzstan.

One of the initial activities is modernization of existing SNiP, majority of which have been developed over the Soviet times and do not currently conform with existing technologies and standards of energy efficiency, earthquake resistance, and environmental sustainability. To fill those gaps, the use of international codes such as the IBC, tailored to the local characteristics of Kyrgyzstan, is an option within reach. National-level new building codes can be developed from best practices, such as ESG-factors and international organization guidelines like ISO and ASCE [6]. Such actions would pave the way for the regulatory framework that could cater to modern construction requirements and safety and quality of infrastructure development.

One of the most robust features of the U.S. regulatory system is its proactive risk management. Adoption and implementation of national methodologies for seismic and climatic risk assessment in construction is an essential step for Kyrgyzstan, given the seismic and geographic characteristics shared by both countries. While the U.S. experiences a greater overall frequency of earthquakes, the number of seismic events in Kyrgyzstan has been steadily increasing each year (fig. 1).

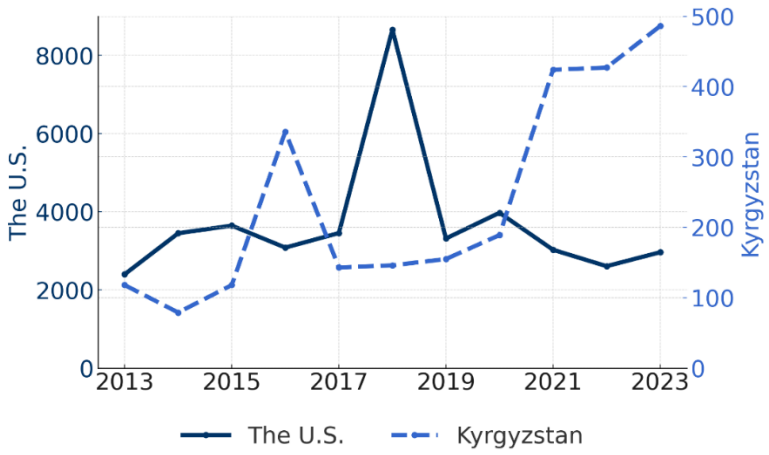

Figure 1. Number of earthquakes with magnitude more than 3 in or near the U.S. and Kyrgyzstan [7, 8].

Such events considerably raise the occurrence possibility of accidents at both completed and ongoing projects. Integrating risk modeling tools into the design process would be a vital step to solve this problem. The approach minimizes the chances of an accident and also ensures cost optimization by finding out the potential vulnerabilities at the very beginning of the project life cycle.

The reform of Kyrgyzstan's regulatory framework for the construction sector, with proper consideration of the U.S. experience, will ensure increased safety and quality in buildings, contributing to the sustainability of infrastructure development in this country. The successful application of the proposed recommendations will, to a great extent, depend on efforts to be taken by the government, the professional community, and international partners [9].

3. Conclusion

The comparative analysis of the regulatory requirements for U.S. and Kyrgyzstan construction industries reflects sharp differences between legislative frameworks, approaches to providing assurance of safety and quality of works, and procedures for oversight and certification. Namely, in the US context, a multi-level character of regulatory structure, readiness for modifications, active positions of the independent organization provided the conditions for incorporating progressive scientific and technological developments into legislation. The regulatory framework of Kyrgyzstan is still centralized, under-resourced, and based on outdated standards. This aspect needs modernization and the introduction of international practices.

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