



Circularity and Sustainability in the Building and Construction Sector in Kazakhstan

NATIONAL REPORT

switchasia



Funded by
the European Union

Acknowledgements

This National Report on *Circularity and Sustainability in the Building and Construction Sector in Kazakhstan* was prepared on behalf of the EU SWITCH-Asia Policy Support Component (PSC) by Dr Ferhat Karaca and Dr Alexandr Belyy, with the guidance of Mr Florian Beranek and Ms Cosima Stahr, under the supervision of Dr Zinaida Fadeeva, Team Leader, and Mr Sachin Joshi, Key Expert, SWITCH-Asia Policy Support Component.

The SWITCH-Asia Programme

© 2025 SWITCH-Asia

Disclaimer

The information and contents in this document are the sole responsibility of the authors and do not necessarily reflect the views of the European Union.

Content

1. Introduction	5
Purpose of the Report	5
Scope	5
Methodology	5
Profile of Kazakhstan's Construction Sector	6
Key concepts of circularity in the built environment's lifecycle	7
2. Key Challenges for integrating circularity into the sector	11
Resource Consumption	11
Environmental Impact	13
Regulatory Barriers	15
3. Opportunities: Market trends and innovation potential	17
Case Study 1: BI Group / Construction Company Level R&D Investments	19
Case Study 2: Modex / Modular and Prefabricated Construction	20
Case Study 3: Respublika / Urban Design	20
4. Policy landscape	21
Case Study 4: Thermal-modernisation project / Energy efficiency	23
Case Study 5: GLB / Modular and Prefabricated Construction	24
Case Study 6: Ergodom - building an organic house	26
Case Study 7: Greenery Charter of Astana City	27
5. Capacities and capabilities assessment	28
Contractors	28
Material Suppliers	29
Using infrastructure projects for bringing forward circularity approaches	29
Case Study 8: Astana LRT - Infrastructure Projects	30
6. Circularity analysis: 10 R principles and cases	31
7. Overall assessment and conclusion	34
References	36

Abbreviations

AIFC	Astana International Financial Centre
BIM	Building Information Modelling
C&D	Construction and Demolition
CDW	Construction and Demolition Waste
CE	Circular Economy
CEAP	Circular Economy Action Plan
DfA	Design for Adaptability
DfD	Design for Deconstruction
EBRD	European Bank for Reconstruction and Development
EPR	Extended Producer Responsibility
ESCOs	Energy Service Companies
ESG	Environmental, Social, and Governance
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GFC	Green Finance Centre
GPP	Green Public Procurement
KazGBC	Kazakhstan Green Building Council
LRT	Light Rail Transit
MtCO₂e	Million tonnes of CO ₂ equivalent
OKED	National economic activity classification
OMIR	Kazakhstan standard of green buildings (the domestic certification scheme)
PaaS	Product-as-a-Service
PPP	Public-Private Partnership
PSC	Policy Support Component (of the EU SWITCH-Asia Programme)
SCP	Sustainable Consumption and Production
SDGs	Sustainable Development Goals
SRMs	Secondary Raw Materials
TA	Technical Advisory

1. Introduction

Purpose of the Report

This report is part of a broader SWITCH-Asia Technical Advisory (TA) project aimed at strengthening SCP and circularity in the building and construction sector across multiple countries in Asia. The report provides an overview of the current state of circularity and sustainability in Kazakhstan's building and construction sector. It outlines key policies that shape the performance of the value chain and practices within the building and construction sector. By reviewing relevant policies, the report highlights the current status, key stakeholders, areas for improvement, and actions needed. It offers practical insights and recommendations to facilitate the transition towards a more circular and sustainable sector. It also presents examples of practices at different construction stages, showing the diverse solutions and challenges when applying circular economy principles and implementing sustainable consumption and production (SCP) strategies in Kazakhstan.

The findings and recommendations are in line with Kazakhstan's national goals for carbon neutrality and its international commitments, such as the Paris Agreement on Climate Change, the 2030 Agenda for Sustainable Development, and the New Urban Agenda. Therefore, the report contributes to the global effort to scale up SCP policies and practices, as well as the international commitments, including the Sustainable Development Goals (SDGs) and the Paris Agreement.

Scope

The construction sector in Kazakhstan plays a vital role in the national economy, contributing approximately 5% to the GDP. In 2022, it was among the fastest-growing industries, with a 9.2% production increase. It is also the largest energy consuming sector in the country, accounting for over 46% of final energy use. This underscores the sector's potential to drive significant environmental and economic impact through circular practices.

The report covers key regions and issues, with a focus on urban centres such as Astana, Almaty and Shymkent. The report addresses critical aspects of the building lifecycle, including design, construction, operation, and end-of-life phases. It emphasizes strategies for material reuse, recycling, and energy optimization, particularly in alignment with green standards such as the recently published national standard and international frameworks.

Methodology

The report is an output of a mixed-methods methodology that combined desk research, expert interviews, surveys of contractors and suppliers, and case studies of pilot projects in Astana, Almaty, and Shymkent. This inclusive approach ensures that the findings reflect the perspectives of policymakers, industry, and academia.

Desk Research: A review of national policies, legislative frameworks, and project documents to understand the regulatory and operational context.

Stakeholder Surveys and Interviews: Surveys were conducted among construction contractors, material suppliers, and policymakers to identify key challenges and opportunities. These were supplemented by interviews with experts and practitioners.

Case Study Analysis: Eight pilot projects were analysed to extract insights into the application of circular economy principles. Projects were evaluated based on their scalability, innovation, and impact on sustainability.

Stakeholders Consultations: Engagement sessions were held with stakeholders to validate findings and co-develop recommendations for improving circular economy practices in the construction sector.

The selection of stakeholders for engagement prioritized representation from national contractors, material suppliers, government bodies, and academia. This approach ensured diverse perspectives and actionable insights.

Profile of Kazakhstan's Construction Sector

The construction sector in Kazakhstan has been rapidly developing over the past few years and is one of the key drivers of economic growth in the country. In 2022, the industry experienced significant growth, with production volumes increasing by 9.2%, while the country's GDP grew by only 3.5%. Construction is also among the leading sectors in terms of growth rates, alongside information and communication technologies, which recorded a growth of 12.6%. The construction sector has a substantial impact on the economy, contributing 5% to GDP. It also has a multiplier effect, stimulating related industries such as manufacturing and trade, making it a vital part of the national economy (Agency for Strategic Planning and Statistics of the Republic of Kazakhstan, 2023).

Urbanisation is currently at 58% and projected to grow to 70% until 2050, with more than a third of the country's population living in the three largest cities.¹ The construction sector is the second-largest industry in Kazakhstan by the number of businesses (organisations), with more than 66,000 entities, representing 13% of the country's close to 490,000 organisations (KazDATA, 2022). According to the national economic activity classification (OKED), the sector is divided into three main categories, which include additional classes and subclasses of construction activities, namely building construction with about 29,000, civil engineering with nearly 9,500, and specialized construction works more than 26,500 organisations.

Kazakhstan's construction sector receives major investment both from state infrastructure programmes and private development. Kazakhstan's overall investment mix has historically been dominated by oil & gas in terms of FDI and export value, while domestically financed construction splits between infrastructure (state programmes), housing and commercial/industrial projects.

In 2023, the volume of construction work in Kazakhstan reached KZT 7,612.8 billion, with housing commissioning increasing in area considerably; private construction accounts for the majority of activity (82.2%).² National investment flows continue to be heavily influenced by oil sector revenues, even as the state pursues diversification and large infrastructure programmes that channel funds into roads, urban utilities and housing. For example the "Nurly Zhol" initiative as part of the "Belt and Road" cooperation with China, has invested billions into infrastructure, transport, and logistics upgradation, as well as formation of regional hub cities. The "Nurly Zher" initiative seeks to increase access to housing through mortgage support, building and renovation programmes, as well as the improvement of municipal infrastructure including central heating, water supply and sanitation, and institutional and regulatory reforms.³

Housing investment comprises a substantial and growing share of construction volumes, with commissioning area and new housing programmes rising in 2022–2023; private housing and multiapartment construction dominate in Almaty and Shymkent, while Astana shows large statesponsored housing investment per capita under the Nurly Zher programme.

1 <https://www.mdpi.com/2413-8851/9/4/100>

2 <https://stat.gov.kz/en/industries/business-statistics/stat-inno-build/publications/68404/>

3 <https://www.mdpi.com/2413-8851/9/4/100>

Kazakhstan's three largest cities - status of the building and construction sector

Almaty:

Almaty is Kazakhstan's largest city and principal market centre, historically shaped by commerce, services and cultural institutions. With a metropolitan population exceeding two million, Almaty continues to attract internal migrants and investment, sustaining strong private housing delivery and a buoyant commercial real estate market. Urbanisation in Almaty is characterised by densification of central districts and rapid peripheral expansion driven by demand for multiapartment housing and logistic facilities. Almaty's construction profile is mixed-use and market-oriented. Recent analyses and market reports (JP-KZ Deloitte, 2023) indicate substantial commissioning of commercial real estate (offices, shopping and entertainment centres) alongside logistics/warehouse projects and residential multiapartment stock. Investment composition in Almaty leans strongly toward housing and commercial real estate, with infrastructure projects (urban utilities, roads) present but less dominant than in Astana.

Astana:

Astana functions as Kazakhstan's political and administrative capital and has experienced state-directed urbanisation since its designation as capital in the late 1990s. The city's population is close to 1,5 million inhabitants. It has been shaped by large, centrally financed infrastructure and housing programmes that aim to accommodate government functions and redistribute investment across regions. Per capita residential construction investment in Astana grew strongly over two decades, and state initiatives such as Nurlı Zhol and Nurlı Zher have channelled significant resources into Astana's roads, utilities and housing; there has been a rapid transformation of the city and improved public infrastructure, even as municipal services face the challenge of servicing newly developed districts. Astana exhibits a construction pattern driven by state programmes and large publicly financed projects. Building types emphasise institutional, administrative, public-use facilities, large-scale residential developments and transport/logistics corridors. Consequently, the city's construction pipeline allocates a higher quota to infrastructure and state-sponsored housing than private commercial development, and it has been central to government efforts to stimulate urbanisation and redistribute investment flows outside resource extraction projects.

Shymkent:

Shymkent is a regional hub in southern Kazakhstan of 1,2 million inhabitants. Its rapid population growth and urban expansion reflect both internal migration and regional economic development. It is one of the major materials production centres and a regional trade node. Its construction activity is currently concentrated on meeting housing demand – both multiapartment and individual housing – and on developing industrial and logistics capacity to serve southern markets. Infrastructure and residential investment in Shymkent is growing but remains smaller in absolute terms than in Astana.

Key concepts of circularity in the built environment's lifecycle

The global construction industry constitutes a major sector of resource utilization and environmental repercussions, accounting for approximately 50% of all extracted raw materials, 40% of total energy usage, and over one-third of worldwide waste production, predominantly from construction and demolition activities. This significant environmental impact results directly from its persistent commitment to a linear economic model defined by a 'take-make-dispose' value cycle.

This paradigm accelerates the exhaustion of limited virgin resources, exacerbates landfill pressure, and leads to considerable economic and material value loss at a building's end-of-life, while the high embodied carbon from manufacturing new materials significantly contributes to global greenhouse gas emissions.

In addressing these systemic difficulties, the circular economy (CE) offers a transformational framework designed to unlock economic activity from resource consumption. It aims to reinvent value generation by closing material loops, prolonging the functional lifespan of buildings and structures, and eliminating waste from the initial design phase onwards.

At the same time, the built environment consumes a large amount of energy for heating, cooling, lighting and other services. Thereby, the construction and building sector play a significant role in driving global carbon emissions, accounting for nearly 40% of total energy-related CO₂ emissions when considering both direct operational emissions and embodied carbon from construction. Decarbonizing the building sector, which targets the planning, construction materials, construction, occupation/use, and demolition phases, is therefore a critical component of global efforts to combat the climate crisis and moving toward more sustainable, circular consumption patterns. By integrating material- and energy-efficient circularity-oriented building designs and renewable energy systems, buildings can drastically cut down on greenhouse gas emissions and other pollutants and decrease their material footprint. Optimising both the materials production and the use of materials not only minimises this material footprint but also extends the lifespan of buildings, reducing the frequency of resource-intensive construction cycles.

The 10 R model of activities implementing circular economy principles

One of the operational frameworks for implementing CE principles within the built environment is the 10R model, which provides a hierarchical ladder of circularity strategies, prioritizing higher-value retention actions to guide decision-making from project inception through to deconstruction and material recovery. The 10R model provides a framework for a more resource-efficient system, starting with the most preferred options:

R0	Refuse	Make product redundant by abandoning its function or by offering the same function by a radically different (incl. digital) product or service.
R1	Rethink	Make product use more intensive (e.g., through product-as-a-service, reuse and sharing models or by putting multiple functions).
R2	Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials.
R3	Reuse	Re-use of a product which is still in good condition and fulfills its original function (and is not waste) for the same purpose for which it was conceived.
R4	Repair	Repair and maintenance of defective product so it can be used with its original function.
R5	Refurbish	Restore an old product and bring it up to date (to specified quality level).
R6	Remanufacture	Use parts of a discarded product in a new product with the same function (and as-new condition).
R7	Repurpose	Use a redundant product or its parts in a new product with different function.
R8	Recycle	Recover materials from waste to be processed into new products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.
R9	Recover	Recovering energy content of materials in the waste stream.

The implementation of the 10R model in construction also operationalizes Sustainable Consumption and Production (SCP) within the built environment. The highest-order strategies—Refuse, Rethink, and Reduce—directly target consumption by enhancing resource efficiency during the design phase. Refuse rejects unnecessary materials or functions (for example eliminating nonessential finishes or duplicated systems); Rethink reframes requirements and uses — favouring lightweight solutions, shared facilities or

multifunctional spaces that deliver the same or greater utility with fewer resources; Reduce minimises material demand through optimised design, rightsizing, standardisation and lean construction practices. Together these interventions lower embodied material flows, simplify downstream circular interventions and deliver the largest lifecycle environmental benefits when applied early in project planning. This entails the application of advanced methodologies such as Design for Deconstruction (DfD) and Design for Adaptability (DfA), which integrate future value recovery into the initial building design, alongside the implementation of lean construction principles to reduce material offcuts and waste.

The five activities ranging from Reuse, Repair, Refurbish, Remanufacture to Repurpose are fundamental to a sustainable production system; this would also include the prolongation of the use phase. Their emphasis is on maintaining the embodied energy, carbon, and economic value of existing buildings and components, which extends their functional service life and reduces the need for primary resource extraction and virgin material production. This systemic transition is dependent on various enabling factors. Digitalization can become an essential tool, as Building Information Modelling (BIM) progresses into detailed “digital twins” and “material passports” that offer specific data on component specifications, maintenance history, and deconstruction protocols, thereby enabling future reuse and remanufacturing. This could also mean a shift in business models, for example from linear take-make-waste models to Product-as-a-Service (PaaS) systems, wherein manufacturers maintain ownership of assets such as facades or HVAC systems and lease their functionality, thereby promoting durability and facilitating end-of-life take-back.

R8 (Recycle) and R9 (Recover) occupy the lower order end of the 10R hierarchy but are essential components of a functioning circular system in construction when higher order options (reuse, remanufacture, repurpose) are impractical or exhausted. They focus on extracting residual value from materials and products at the end of their service life and returning that value—either as secondary raw materials or as energy—back into industrial and societal systems. In the building and construction sector, recycling converts construction and demolition (C&D) waste into secondary raw materials for use in new products, components or construction inputs (for example: crushed concrete as aggregate, reclaimed metals, sorted plastics for profiles or insulation). Effective recycling reduces demand for virgin materials, lowers embodied carbon, and can reduce waste sent to landfill when applied at scale.

Recovery sits at the base of the hierarchy as a last resort pathway to reclaim energy content from construction waste streams that cannot be economically or technically recycled. Recovery typically takes the form of controlled combustion (incineration with energy capture), anaerobic digestion for organics, or other thermal/chemical processes (e.g., gasification, pyrolysis) that convert waste into heat, electricity or fuel feedstocks.

The integration of circular principles, supported by policies like Green Public Procurement (GPP) and Extended Producer Responsibility (EPR), reduces the ecological footprint of the sector while also generating economic opportunities. This approach leads to new markets for secondary materials, creates skilled jobs in remanufacturing and deconstruction, and lowers the lifecycle costs of buildings and structures, while minimising their economic externalities, like pollution and waste, which are unaccounted for in the current linear paradigm.

The 10 Rs in a building's lifecycle: the six “stages” of construction

Integrating circular economy considerations into the construction sector necessitates a systemic transition from the current linear model. Utilizing the 10R framework, the principles of circularity can be mapped directly onto the specific phases, or “stages”, of a construction project's lifecycle. The circularity requirement is simultaneously incorporated into every stage of the process, ranging from initial macro-level planning decisions to the detailed micro-level aspects of material recovery, and demolition as the final step for closing of the circularity loop. Each stage presents distinct opportunities and challenges, yet they are closely interconnected; decisions made in the initial phases significantly influence the circular potential achievable at the conclusion of a building's life. Construction sector actors must cohesively apply these principles across all six stages of the lifecycle to fully embrace circularity.



Urban and Rural
Planning and
Zoning (why,
what, where)

Planning and
Design of
engineered
structures

Material
extraction,
manufacturing,
R&D

Construction
works incl.
logistics

Maintenance
and Facility
Management

Deconstruction
and Demolition

In each stage, there are fundamental considerations for applying circular principles:

1. Urban and Rural Planning and Zoning (Why, What, and Where)

Planners can prioritize the adaptive reuse of existing structures, instead of defaulting to new builds. This stage offers a high potential for circular impact by applying the principles of Refuse and Rethink.

2. Planning and Design of Engineered Structures

This is where circularity is embedded into the physical asset through Rethink and Reduce practices. Architects and engineers have a critical role in designing for longevity, adaptability, and eventual disassembly allowing for Reuse, Repurpose, Remanufacture, and Recycle.

3. Material Use, Manufacturing, and R&D

This stage focuses on closing material loops in the supply chain through Recycle, Remanufacture, and Reduce. It can also set the basis for Repurposing and Reuse.

4. Construction Works incl. Logistics

Construction is based on decisions made during all prior phases. On-site execution is crucial for minimizing immediate waste; value preservation of materials is achieved through Reduce and Reuse strategies.

5. Maintenance and Facility Management

The use-phase is where value is preserved and a product's life span is extended through Repair, Refurbish, and Reuse.

6. Deconstruction and Demolition

This final stage in a circular model focuses on Reuse, Repurpose, Remanufacture, and Recycle.

The transition to a circular system is a complex and incremental process, requiring the cooperation of a multitude of actors over different time horizons. For example, the potential for value recovery during deconstruction is fundamentally determined by design decisions made in the planning phase. The initial and essential action is to commence the process by identifying committed decision-makers and implementers. Implementing a singular circular practice, such as enhanced on-site waste segregation or the design of a project for disassembly, fosters essential knowledge, illustrates economic feasibility, and generates the momentum required for wider systemic adoption. It also demonstrates the need to shift policy frameworks towards circularity, creating the right incentives at different governance levels. A comprehensive shift would also include sanctions for non-circular practices, and monitoring to inform where incentives and sanctioning mechanisms need adjustment, as well as making linear models less profitable and feasible at national level, for example through taxation and import requirements. This can spur innovation and a shift in market actors' priorities.

2. Key Challenges for integrating circularity into the sector

Resource Consumption⁴

The construction sector in Kazakhstan presents a particularly challenging context for implementing circular economy principles because of its dynamism, structural composition, entrenched material- and energy-intensive practices, and the country's vastness as the fifth largest country globally. The sector's rapid expansion in recent decades under the linear paradigm has created a built environment and supply chain that are not configured to prioritise material efficiency, reuse or closed-loop recovery. (Torgautov et al., 2021)

In 2019, Kazakhstan's construction sector used an estimated 65 million tonnes of materials, of which roughly 30% were imported. Domestic extraction and production for these materials generated about 13.9 MtCO₂e annually – nearly 4% of the nation's total greenhouse gas emissions (World Bank, 2024).

The building sector is the largest consumer of energy in Kazakhstan. According to the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan, it accounts for over 46 % of final energy consumption. Notably, this figure does not include energy consumption in the individual residential sector. In recent years, this sector has surpassed industry, which accounts for only 31% of energy consumption. Energy consumption in the residential sector increased by 28.3% in 2021 compared to 2019 (2019 – 11.8 million tons of oil equivalent, 2020 – 13.5 million tons, and 2021 – 14.7 million tons).

The market structure and firm size distribution are not favourable for the systemic change needed for integrating circularity. There are only few medium and large firms, as the majority of sector actors are small enterprises, and nearly half are geographically concentrated in Astana and Almaty. These small firms typically lack the technical capacity, risk appetite and capital to pilot deconstruction techniques, material takeback schemes or onsite sorting and storage required for reuse.

The domestic production system concentrates on high-throughput materials – cement (10–12 million tonnes annually), ready-mix concrete and brick. Manufacturing processes are inherently carbon and material-intensive and for which current industrial configurations provide limited pathways for substituting low-impact alternatives at scale. The predominance of monolithic concrete and reinforced concrete systems, together with large volumes of ready-mix concrete and Portland cement consumption, limits opportunities for component reuse and complicates deconstruction. Product categories that are predominantly imported (tiles, sanitary ware) enter supply chains without takeback or extended producer responsibility arrangements, meaning usable components are lost at end-of-life.

Regarding recycling of construction and demolition waste, the geographic vastness and concentration of production in particular regions make collection, transport and economic consolidation of construction and demolition (C&D) waste costly. Without efficient reverse logistics and localised processing, the value proposition for salvaging and reusing components declines rapidly relative to landfilling or low-value crushing for aggregate.

Limited availability of data and a lack of understanding related to resource efficiency are a key challenge. The shortage of data on secondary raw materials (SRMs) and the need for enhanced data collection capabilities in areas such as construction and demolition waste (CDW) management are critical factors to address. Moreover, stakeholder resistance and hesitancy to participate in collaborative studies poses an additional obstacle to progress. The sector requires a more collaborative approach to identify synergies, share knowledge, and improve working practices. A symbiotic ecosystem is essential not only for material exchange but also for fostering a culture of collaboration and innovation.

Developers and contractors frequently operate under time and cost pressures that prioritise standard, proven delivery methods. Without accessible data on the embodied impacts of alternative materials, verified quality

4 Facts and figures for this section sourced from: KazDATA, 2013-2022; Loginov, 2024; Qazindustry, 2019; Sabekov, 2023.

standards for salvaged components, or demonstrably bankable business models for circular practices, stakeholders default to conventional procurement and disposal practices.

Addressing these interdependent challenges requires coordinated policy, investments in reverse logistics and recycling infrastructure, capacity building targeted at small and medium enterprises, and market instruments that internalise the external costs of linear construction. Only by aligning economic incentives, technical standards and supplychain logistics can Kazakhstan move from highvolume material consumption toward a resilient, circular built environment.

Key Construction Materials Produced in Kazakhstan (JP-KZ: Deloitte, 2023)

- **Cement:** Kazakhstan is a major producer, fully meeting domestic demand and exporting surplus. Cement production in 2023 reached 10.5 million tons.
- **Ready-Mix Concrete:** Production in 2023 was 17.2 million cubic meters, fully covering domestic market needs.
- **Bricks:** In 2023, the country produced 1.2 million cubic meters of ceramic non-refractory bricks and 1.0 million tons of silicate and slag bricks.
- **Construction Mortars:** Production in 2023 totalled 1.5 million tons.

Construction Materials Primarily Imported to Kazakhstan (Loginov, 2024; Sabekov, 2023)

- **Ceramic Tiles:** Imports accounted for a significant share of the total construction material imports in the first half of 2023.
- **Wallpaper:** Paper wallpaper imports also make up a notable part of imported materials.
- **Sanitary Ware:** Items like porcelain sanitary products are mostly imported due to insufficient domestic production (Loginov, 2024).
- **Flooring Materials:** Limited local production necessitates significant imports of flooring products

Import Statistics (Qazindustry, 2019)

- From January to June 2024, imports of construction materials amounted to \$542.1 million, a 4.1% decrease compared to the same period in 2023. In physical terms, imports totaled 1,416.2 thousand tons, a 7.3% decline.
- **Key Suppliers:** Russia (41.6%), China (26%), and Uzbekistan (6.4%)

Problems of reducing resource consumption and waste in the construction sector

Due to the increase in construction volumes, there is also an increase in the amount of construction waste, which creates environmental and economic challenges. Insufficient awareness of participants in the construction process, a weak regulatory framework and limited infrastructure for circularity, or even waste recycling, are all hindering the potential transformation.

Generally, circularity remains in its early stages in Kazakhstan: not even 3% of construction-demolition waste is recycled despite a 2020 landfill ban (Karaca / Tleuken, 2023). In Kazakhstan, the construction sector involves more than 52,000 stakeholders, of which only about 2% specialise in waste collection, treatment, and disposal, while the majority (84%) are engaged directly in construction activities (Torgautov et al., 2021). This indicates that circular activities, such as material recovery and reuse, remain very limited within the sector (Torgautov et al., 2021).

The following problems have been mentioned as problematic to the sector in general in expert reports and publications, while also having implications on the integration of circularity.

Integrating circularity requires early, cooperative decisions by multiple actors – developers, designers, contractors, and material suppliers. These approaches include design for disassembly, on-site segregation, or, in the case of renovation, deconstruction and staged refurbishment. Yet oftentimes, circularity is undermined by pressured scheduling and the willingness of contractors to accept customer timetables in order to secure work. Short delivery horizons are still incompatible with circular approaches, as due to their newness necessitate more planning time, coordination, and phased handovers. Opportunities for disassembly and the collection of reusable parts are not realised when contractors work under time pressure. Additionally, rushed sites often result in contaminated, mixed waste streams that lower value recovery and recycling yields. Circular interventions are thus marginalized in procurement and long-term material stewardship is eroded as a result of this.

Investments in circular design decisions necessitate shared accountability across design and delivery teams, and a strong commitment by the developer or future owners. For construction sequences to allow for later reuse, design for circularity requires coordination and accurate documentation (material passports, disassembly details, tolerances). Designs are often primarily done for regulatory approval, leading to errors and on-site improvisation. These modifications can result in decisions that target project completion rather than circularity and possibilities for reuse are then removed.

Poor cost estimation and risk assessment skew the economic calculations thus obstructing the adoption of circular practices. Bid estimates do not routinely include reuse, refurbishment, and high-quality recycling. Contractors lack the margins necessary to cover the transaction costs of circular processes, such as extra labour for selective dismantling, segregation, storage, certification of reclaimed materials, and coordination with recycling processors, when they underprice work to win contracts, especially when working under pressure. Laws that permit price revisions for increases in material costs of more than 10% are not specific enough to cover costs unique to circularity and do not take upfront investments into account.

In addition to the problems noted above, other issues are actively discussed among professionals in the construction sector of Kazakhstan:

- **Rising cost of building materials:** Increasing prices for materials lead to more expensive projects and construction delays.
- **Shortage of skilled labour:** The shortage of specialists slows down the implementation of projects and reduces the quality of construction.
- **Corruption:** Lack of transparency in procedures and bribery make it difficult for the industry to develop.
- **Insufficient funding and investment:** Limited financial resources hinder the implementation of large projects.
- **Impact of inflation:** Rising inflation increases construction costs and reduces the profitability of projects.
- **Developers:** Failure to fulfil obligations by developers undermines the confidence of buyers and investors.

Environmental Impact

There is a very limited amount of information available regarding the environmental impact of the construction sector in Kazakhstan. Official statistics and environmental condition reports do not include dedicated sections assessing the sector's environmental effects.

In particular, the carbon footprint of construction material production is not evaluated. There is also no statistical tracking of harmful emissions from the construction sector into the atmosphere, water, or soil. The only available data relate to construction waste and the energy efficiency of existing buildings.

Solving this data gap with a monitoring and tracking system was therefore one of the key recommendations of a recent report and action plan (Circular Economy Action Plan – CEAP) by the World Bank on enabling the circular practices of the sector in Kazakhstan (World Bank, 2024).

Some analytical data on expenditures related to environmental protection in the construction sector exist (Ranking.kz, 2023). For example, in 2022, environmental protection expenditures in the construction sector reached 13.4 billion KZT, a 47.8% increase compared to the previous year. Most of these expenses were allocated to waste management (2.2 billion KZT), reflecting a year-on-year decrease of 1.9%. Companies also commonly spent on wastewater treatment (574.1 million KZT, a decrease of 52.2%) and air quality protection and climate change mitigation (535.7 million KZT, a decrease of 23.9%).

In regional terms, the highest environmental protection expenditures in the construction sector were recorded in Astana: 6.8 billion KZT, compared to 4.8 billion KZT in the previous year. This represents an annual growth of 43.4% in monetary terms.

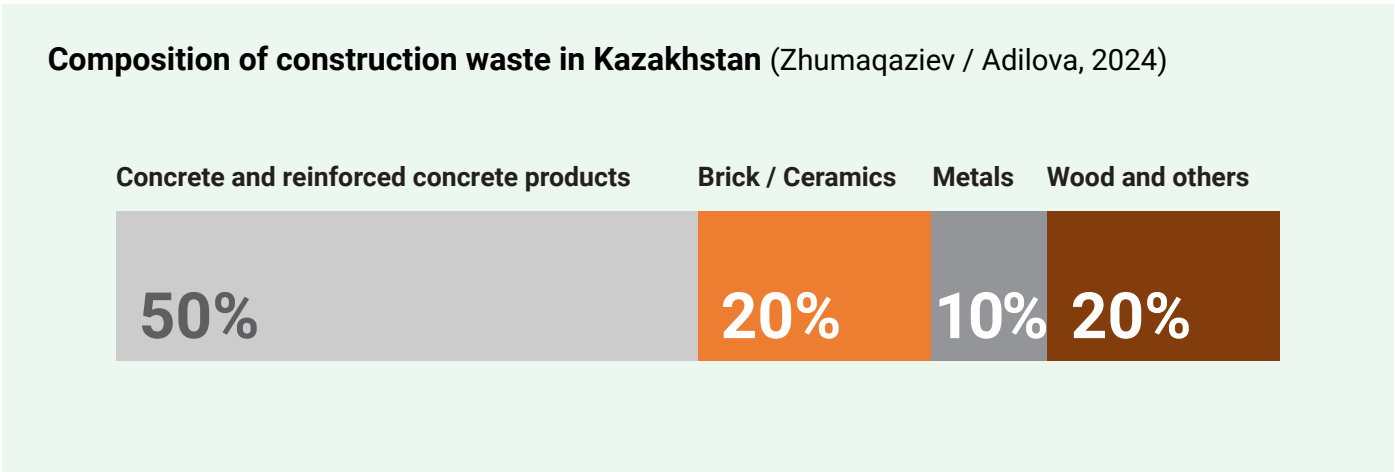
Research indicates that the volume of construction waste in Kazakhstan continues to grow, driven by the increasing scale of construction and renovation of buildings and infrastructure. According to data from the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan (Ministry of Ecology and Natural Resources of the Republic of Kazakhstan, 2023), the total volume of construction waste in Kazakhstan for 2022 was 482.2 thousand tons.

At the same time, only 17.7 thousand tons of construction waste were sent to landfills in 2022 (Ranking.kz, 2023). According to media reports (OSDP, 2025; Zhazetova / Stavrianidi, 2023), spontaneous dumps of construction waste are forming around major cities in Kazakhstan. While local authorities are making efforts to combat these dumps, the rapid growth of construction in urban areas often causes the dumps to expand faster than they can be eliminated.

Approximately 70% of construction waste can be recycled and reused.

The main challenges in managing construction waste in Kazakhstan are as follows:

- **Insufficient infrastructure for waste recycling:** Kazakhstan faces limited infrastructure for the collection, sorting, processing, and recycling of construction waste. The lack of specialized processing centres and landfills, as well as an insufficient number of recycling facilities, creates significant obstacles to effective waste disposal.
- **Lack of a regulatory framework:** The absence of clear legislative regulations in the field of construction waste management can hinder effective disposal efforts. It is necessary to develop and implement appropriate legal acts that define responsibilities and accountability for managing construction waste.
- **Lack of awareness and education:** Insufficient awareness among construction companies, workers, and the public about issues related to construction waste management can lead to improper handling and missed opportunities for recycling and reusing waste.
- **Low economic incentives:** The absence of economic incentives for recycling and reusing construction waste may limit the development of the waste recycling industry. Mechanisms need to be established to encourage construction companies and businesses to use construction waste in production and the creation of new materials.



Regulatory Barriers

Institutional and regulatory gaps limit uptake of circularity considerations. Many reports (e.g. *Ranking.kz*, *KazInform*, and publications by the Ministry of Industry and Infrastructure Development) emphasize spontaneous construction-waste dumps and the absence of economic incentives for recycling. The available evidence indicates that awareness among project participants of resourceefficient and circular practices is insufficient and that the regulatory environment for waste management and material stewardship remains weak. Where policy and standards are absent or unenforced, market actors have little imperative to adopt design for circularity, mandatory source separation on sites, or producer responsibility schemes for highvalue products. The lack of incentives, combined with limited infrastructure for recycling and component refurbishment, perpetuates linear flows (Durdyev et al, 2025).

Fragmented Regulatory Framework

Construction activities in Kazakhstan are governed by a large body of regulatory and technical documents consolidated in AGSK-1. The catalogue is approved by the Committee for Construction and Housing & Communal Services (KDS) under the Ministry of Industry and Construction (MIC) pursuant to the official catalogue rules; the annual information edition is prepared and disseminated by KAZGOR (CenterInform).

This fragmentation produces significant coordination challenges across agencies and levels of government, creating legal ambiguity for practitioners seeking to adopt novel approaches. The number of overlapping norms complicates compliance checks, slows decisionmaking and raises the transaction costs of implementing circular business models. In practice, firms face uncertainty about which standards apply to secondary materials, reuse processes or recycling operations, deterring experimentation and the scaling of circular practices (Communications Service Kazakhstan, 2023). While the number of overlapping norms can complicate compliance for circular business models, efforts are being made to make the situation more transparent, for example, with establishment of the Center for Rationing in the Construction in 2011 as part of the “Kazakh Research Institute of Construction and Architecture” of the Committee for Construction and Housing and Communal Services (KazNIIS, 2025). Authorities are pursuing additional streamlining and transparency measures, including the E-Qurylys digital platform and the digitalisation of the State Urban Planning Cadastre, which aim to shorten timelines and improve enforceability.

Lack of Incentive Mechanisms

Current legislation does not provide sufficiently robust incentives to stimulate demand for secondary materials or the deployment of recycling technologies within the construction sector. Financial and procurement frameworks largely favour conventional supply chains and virgin materials, and statutory support for circular processes—such as tax relief, preferential procurement for reused content, or grants for onsite sorting and refurbishment—is limited. The absence of clear economic drivers reduces the business case for contractors and material producers to invest in the infrastructure and processes necessary for a functioning circular economy (Karaca, et al., 2024).

Administrative Barriers

Complex and sometimes contradictory approval and permitting procedures present a further obstacle to adopting innovative and environmentally sustainable construction solutions. Lengthy authorisation processes, inconsistent interpretation of standards between inspectors, and multiple overlapping permit requirements create delays that disproportionately affect pilot projects and firms attempting to deploy nonstandard materials or techniques. These administrative barriers raise project risk, erode the predictability required by investors, and discourage the uptake of technologies that would enable circularity, such as adaptive reuse, modular deconstruction or onsite material recovery (NCE RK, 2024).

Impact of Existing Rules and Regulations on Innovation in the Construction Sector

The current regulatory framework can discourage the adoption of new technologies and materials. Complexity, redundancies and the absence of streamlined guidance for nontraditional approaches increase approval time and costs. For instance, when clear regulatory pathways for novel construction materials are lacking, practitioners encounter delays and legal uncertainty that hinder trial deployment and market entry. This regulatory friction reduces incentives for firms to develop or import circular solutions and favours continuation of established linear practices.

Insufficient digitisation in regulatory practice has produced a low rate of digital technology adoption within the construction industry. Where statutory requirements do not mandate interoperable digital processes—such as digital building permits, material passports or electronic document management—administrative inefficiencies persist. This regulatory gap slows innovation by impeding datadriven workflows that are essential for traceability, lifecycle assessment and scalable circular business models (Levin, 2024).

3. Opportunities: Market trends and innovation potential

Updating Kazakhstan's regulatory framework—through a consolidated Construction Code and aligned technical standards—offers a clear opportunity to create the enabling conditions for circular innovation in the building sector (CCS, 2023).

As a first option (see table below), taxing virgin materials and enforcing Extended Producer Responsibility (EPR) can advance circularity in the building sector by internalising the external costs of linear production and strengthening resource security. Higher taxes on primary inputs create price signals that favour reuse, recycling and design for circularity, while EPR shifts endoflife responsibility (and costs) onto producers, incentivising product durability, reparability and takeback schemes. As a largescale policy, however, it demands robust governance, careful calibration to avoid regressive impacts, and systems for monitoring, enforcement and crossborder alignment. If welldesigned, the combined measures embed circular thinking across supply chains and investment decisions.

Another option would be the rationalising of currently contradictory provisions, streamlining approval pathways, and setting unambiguous technical requirements towards circularity. This can reduce compliance costs, generate consistent data streams, and make it easier for developers and manufacturers to trial and scale novel circular solutions.

The recent step of integrating Eurocodes into national standards illustrates this approach (Jibek Joly, 2021): by adopting internationally recognised specifications, regulators have lowered technical barriers to contemporary materials and methods, while improving structural design, seismic resilience and safety. Crucially, modern codes can also require or facilitate the collection of data on construction and demolitionwaste tonnages, secondarymaterial uptake and building energy intensity—metrics that are currently scarce and thus hinder evidencebased incentives for reuse and recycling. By coupling code reform with mandatory reporting and procurement preferences for recycled materials, regulatory renewal can shift economic signals in favour of circular practices and catalyse wider market uptake (Torgautov et al., 2021).

Material passports combined with building information modelling (BIM) offer a substantial opportunity to embed circularity across Kazakhstan's building lifecycle. By recording material origins, composition, quantities and anticipated service lives, material passports make secondaryvalue visible and tradeable; when linked to BIM they enable lifecycle-aware design, facilitate deconstruction planning and support reuse and highquality recycling. Kazakhstan's national "EKurylys" unified information system demonstrates that digitisation in safety and technical documentation can be effectively mandated, reduce paperwork and surface nonconformities (Torgautov et al., 2021). With government encouragement of BIM uptake, these tools can lower transaction costs for circular business models, improve quality control, and unlock evidence needed for procurement preferences and finance tied to embodiedcarbon and materialcircularity outcomes.

Another opportunity is the national initiative of enabling constructionanddemolition (CDW) recycling centres. In a recent study (Karaca / Tleuken, 2023), the development of eight recycling centres across Kazakhstan's largest urban areas was proposed, capable of treating 84 million tonnes of debris at 95% efficiency. Implemented, for example, as municipal public private partnerships (PPPs) with private finance and land contributions from city authorities, these centres could divert significant volumes of debris from landfill, supply secondary aggregates to domestic markets, reduce embodied emissions from material production, and create local jobs—thereby improving competitiveness in the construction supply chain. Success would depend on the establishment of a legal framework allowing for a market-based mechanism to incentivise the use of recycled materials, as well as realistic performance indicators, and longterm financial planning to manage demand risk and operational costs.

Intervention	Current Baseline	Drivers & Constraints	Potential impact for circularity (1-5)	Rationale
Taxation of virgin materials, enforcement of extended producer responsibility	Non-existent (outside of toxic materials)	Resource security; large-scale intervention with unforeseeable consequences/governance requirements	5	Integrating circularity considerations by forcing internalisation of linear system costs for producers
Regulatory requirements to build information system: e.g., waste audits, CE protocols and certification	Non existent	Landfill ban (2021) and Modernisation of the Construction Code; additional layer of “red tape” and industry interests	5	Enabling market-based mechanisms
C&D waste recycling hubs	<3 % recycling; World Bank (2024), feasibility study by Karaca / Tleuken (2023)	Landfill ban (2021); lack of investments	5	Strong policy push, clear investment plan, proven technology
Green-finance mobilisation	1,15% of current outstanding loans qualifies as “green” (AIFC / GFC, 2024)	Government subsidies + investor appetite; current awareness is low outside of voluntary ESG commitments	4	Capital is increasingly available; pipeline maturity is key
Modular prefabrication	Existing companies, e.g., Modex	Prefab factory initiative and policy interest in BIM integration; unclear regulation	3	Productivity gains attractive, yet upfront capital expenditure and skills gaps
Capacity building	CE only recognised as cost factor/ end of life; little understanding of transformative aspects and innovation potential, e.g., BI Group	Company R&D departments, cooperation between academia and private sector, sector associations; current awareness is low	3	Awareness of potential regulation/ ESG considerations, and connection to circularity
Pilot projects	Several buildings and developments in Astana and Almaty, e.g., Respublika	Commitment to upgrading building stock and experience; upscaling difficult if no valid business case (see 1-2 above)	3	Bringing together stakeholders, strengthening experience, learning by doing

Thirdly, Kazakhstan's greenfinance landscape is nascent but expanding, driven by growing regulatory support and investor interest in environmental, social and governance factors regarding investment decision (ESG). The country adopted a National Green Taxonomy in 2021 to classify eligible activities and mobilise capital for lowcarbon projects, and the Astana International Financial Centre's Green Finance Centre has supported issuers with frameworks and verification for green bonds and loans, helping to scale labelled instruments (AIFC Green Finance Centre, 2024; Green Taxonomy Kazakhstan, 2022). Issuance of green bonds and sustainabilitylinked loans since 2020 signals increasing market appetite, while domestic exchanges and regulators promote ESG disclosure standards to raise investor confidence (Khoroshevskaya, 2021). Nevertheless, awareness and consistent application of ESG criteria among many local developers and investors remain uneven; uptake is strongest among larger firms and projects linked to international finance, indicating scope to mainstream ESG through clearer taxonomy alignment, capacity building, and incentives for greencertified buildings (OECD; AIFC sources).

Fourthly, allowing for and promoting modular and prefabricated construction also presents a highvalue opportunity for Kazakhstan to accelerate its transition to a circular building sector (Bello et al., 2024). Prefabrication moves repetitive manufacturing tasks offsite into controlled environments, enabling standardised components, precise material planning and reduced onsite cutting and waste. That shift reduces constructionanddemolition (C&D) waste sent to landfill, lowers transport and handling losses, and improves resourceuse efficiency—core circulareconomy objectives (Akinradewo et al., 2021). When components are designed for disassembly, modular systems support reuse, remanufacture and longer service lives, keeping valuable materials in circulation and reducing demand for virgin inputs. Offsite production also strengthens quality control, delivering more durable buildings with fewer defects and lower lifecycle maintenance needs. Critically for Kazakhstan, modular methods compress delivery timelines by enabling parallel production and site works, helping meet urgent housing and infrastructure demands while limiting the environmental footprint of rapid expansion. To realise these benefits at scale, policy and finance measures are required: updated technical standards and approvals for factorybuilt components, incentives for designfordisassembly, workforce upskilling, support for local prefab manufacturing capacity, and procurement rules that reward lower embodied carbon and circular product attributes.

Case Study 1: BI Group / Construction Company Level R&D Investments

BI-Group⁵, a leading construction company in Kazakhstan, has established a unit for further developing sustainable and circular approaches. By investing in research and development, BI-Group is exploring ways to reduce waste, promote resource efficiency, and extend the lifespan of building materials. The department's work encompasses a wide range of areas, including:

- Developing standardized, prefabricated components that can be easily reused, repaired, and remanufactured.
- Investigating new materials with enhanced durability, recyclability, and sustainability.
- Incorporating circular economy concepts into the design and construction process.
- Exploring innovative methods for reducing, reusing, and recycling construction waste.
- Assessing the environmental impact of building materials and construction processes throughout their entire lifecycle.

Through its R&D department, BI-Group is actively contributing to a more sustainable and circular future for the construction industry in Kazakhstan. By bringing forward innovative solutions, the company is improving its environmental performance and also serves as an example for sustainable construction practices in the market.

5 <https://bi.group/>

One of the main barriers towards enabling circularity practices in the construction sector in Kazakhstan has been identified as the lack of knowledge among sectoral experts, including designers and engineers (Durdyev et al., 2025). Training the experts (including designers, project managers and engineers) in the sector is therefore a key intervention to enable a transition towards circular practices in the sector, where practical solutions are implemented, resources are used efficiently, and waste is minimized. The formation of R&D departments at the company level, initiating a focus on developing circular solutions, can play an important role in providing the necessary training, knowledge support, and motivation to professionals. In addition, collaboration and coordination across academia, private sector, and government is required to enable benefits such as innovation and technological advancement, reduced environmental impact, economic growth, job creation, and improved resource security.

Case Study 2: Modex / Modular and Prefabricated Construction

Modex is a Kazakhstan company specializing in modular construction⁶. Owned by BI Group, it has emerged as a leader in prefabrication. The factory features an automated fabrication of lightweight concrete blocks, significantly reducing waste and construction time. About 80% of the work is carried out at the factory, and buildings are assembled on site, also reducing pollution, dust and minimising noise during the construction. The production of modules can continue across winter time, so the modular fabrication of a 16-storey house requires about 6-7 consecutive months, whereas their automation supported assembly requires 16 months. Modex sells and rents the apartments fully finished, at competitive price points. The company's modular approach has also led to substantial cost savings, particularly in terms of labor expenses. In one of the 16-story apartment building “7Я”, constructed in Astana 3 years ago, a total of 442 prefabricated modules were transported into the city and assembled by the ModeX team to construct . Modex is deployed at 25 projects, and more than 10 finished buildings demonstrate the viability and benefits of their approach. So far, no building has been disassembled, but the modular construction would make it possible.

Lastly, a tried and tested approach for strengthening circularity approaches in the building and construction sector is to implement pilot projects that serve as proof of concept or testing ground, even in a context where circularity is not a key paradigm of the economy. Because of this, circularity considerations are integrated for specific products or functions only – for example, by considering energy efficiency or insulation of the building, or by the use of long-lasting, recyclable materials. Also, urban development paradigms or technology as seen in other cities or countries may be adapted to the local context.

Case Study 3: Respublika / Urban Design

“Respublika” is a residential district in Astana, designed as a “city within a city.” The project includes a variety of residential buildings, schools, kindergartens, medical centers, sports zones, and shopping areas, ensuring a comfortable and safe lifestyle. The zoning of the complex minimizes the need for trips outside the area, reducing the transportation carbon footprint. Additionally, infrastructure planning ensures the long-term use of facilities and waste reduction, creating conditions for material reuse and recycling.

The project employs energy-efficient technologies like surveillance systems and triple-glazed windows and local materials, minimizing carbon emissions. It also incorporates reusable and recyclable building materials, promoting circularity in construction. This approach reduces the carbon footprint and facilitates future material recycling, aligning with core principles of a circular economy.

The “Respublika” project has been a significant step forward in promoting circular economy principles in the construction industry. Further progress requires the involvement of all stakeholders, improved policies, and international support.

6 <https://bi.group/ru/modex>

4. Policy landscape

Government Incentives and Programmes Supporting Circular Economy Initiatives in Kazakhstan

Kazakhstan's transition to a circular economy within the building and construction sector is guided by several government incentives, regulatory frameworks, and strategic programs aimed at sustainability and energy efficiency. These measures address key aspects such as energy conservation, waste management, green construction, and resource efficiency.

Strategic Initiatives

- Kazakhstan's 2050 strategy (2012): The ambitious vision of joining the top 30 developed nations by 2050 which aligns closely with the goals of a CE. To achieve this vision, Kazakhstan has prioritized energy efficiency, reduced greenhouse gas emissions, efficient water use, waste management, and resource conservation. The strategy has recognized the construction sector's potential to drive circularity and highlighted its importance in achieving Kazakhstan's broader sustainability objectives (World Bank, 2024).
- Concept for Transition to a Green Economy (2013, amended in 2024): Focuses on reducing carbon emissions and encourages the use of sustainable materials and energy-efficient technologies. This concept integrates sustainable urban planning and green building initiatives.
- Strategy for Achieving Carbon Neutrality by 2060: Includes measures for energy-efficient building designs and the adoption of renewable energy sources in construction. Key initiatives involve transitioning from coal-based heating systems to renewable alternatives. The 2060 strategy addresses a long-term development strategy to reduce greenhouse gas (GHG) emissions and decarbonise the economy. The strategic directions for sustainable development of the country would include the development of CE (AIFC, 2022).
- Roadmap to Carbon Neutrality: This draft document outlines steps for improving energy efficiency and incorporating renewable energy in buildings. However, it lacks specific implementation timelines and detailed accountability structures.

Energy efficiency of buildings / operational carbon footprint

Kazakhstan's energy-efficiency agenda is framed by the Law on Energy Saving and Increase in Energy Efficiency (2012, amended 2015), which obliges large consumers to undergo regular energy audits, stipulates building-class labelling, and empowers authorities to impose fines for non-compliance. Persistent barriers—such as ageing Soviet-era building stock, tariff subsidies, and limited uptake of energy service companies (ESCOs)—are overcome by concessional climate finance and a growing renewables incentive scheme that reduces the carbon factor of district heating. Within this policy landscape, the voluntary Kazakhstan standard of green buildings (OMIR)⁷, launched by the Kazakhstan Green Building Council (KazGBC), offers a domestic certification analogous to LEED and BREEAM.

OMIR evaluates projects across nine categories: energy, water, materials, waste, indoor environmental quality, site ecology, management, transport accessibility and leadership, with energy credits weighted most heavily. Compliance must at least meet national Class «C+» performance, which is roughly equivalent to the 2012 code's 15% energy saving over legacy stock. Since April 2025, building on international expert recommendations, KazGBC has raised OMIR's minimum energy efficiency threshold for certification from

⁷ **OMIR** is the Latin transcription of the Kazakh word “Өмір” (Ömir), which translates as “Life.” Within the name of the OMIR standard, this word functions both as an abbreviation and as a symbol, conveying the idea of sustainable, “green” construction.

Class «C+» to Class «B», equivalent to an average of 30% energy savings compared to the national baseline. Moreover, OMIR has been expanded with entirely new criteria addressing climate change adaptation, introducing resilience considerations into building evaluation for the first time in Kazakhstan – and indeed across Central Asia. Certification is conducted by KazGBC-accredited professionals; successful projects receive OMIR labels (Bronze, Silver, Gold, Platinum) and enter the national registry, a prerequisite for accessing green-taxonomy finance or obtaining green mortgages, a credit product promoted by Kazakhstan’s Otbasys Bank. Early pilots such as Aruna City in Astana and the Dostyk and Shymkent Plaza malls have achieved Gold ratings, reporting operational energy reductions above the 20% financing threshold and demonstrating the scheme’s practical viability. (QazaqGreen, 2025).

Financial incentives for stimulating green and circular initiatives

- **Green Taxonomy:** Provides a classification system for projects eligible for green financing, including construction projects that align with circular economy principles.
- **Green Bonds:** Issued to support sustainable development projects, including low-carbon building initiatives. These bonds enable developers to access capital for implementing energy-efficient solutions.
- **Green Mortgage Programs:** Otbasys Bank offers incentives for individuals and developers building energy-efficient certified structures. This initiative is part of a broader effort to stimulate green construction across the country.
- **International Support:** Organisations like the European Bank for Reconstruction and Development (EBRD) and the World Bank fund green construction and energy efficiency projects. For instance, pilot projects supported by these organisations demonstrate substantial energy savings through thermal modernization efforts.

Since 2023 Kazakhstan has elevated energy efficiency policy—most notably through the Concept for the Development of Energy Saving and Energy Efficiency for 2023–2029, which targets a 10% reduction in energy consumption per unit area by 2029 relative to 2021. This policy focus creates a formal entry point for measures that reduce operational demand (better insulation, systems optimisation, adaptive reuse). However, implementation gaps persist. Retrofit standards and enforcement are uneven, financing for energy renovations is limited, and new construction does not consistently meet higher performance thresholds.

Carbon intensity of building materials / embodied carbon footprint

Awareness of embodied carbon is growing within Kazakhstan’s policy architecture—reflected indirectly in the Environmental Code, the 2013 Green Economy Concept (updated), and the national 2060 carbonneutrality strategy—but there is no standalone regulatory framework for embodied carbon in construction. Promotion of Best Available Technologies and nascent adoption of international and national green building standards (LEED, BREEAM, OMIR) indicate demand for lowercarbon materials. Nonetheless, the absence of mandatory material carbon accounting, labelling or procurement criteria constrains supplyside transformation. Without standardized measurement, material passports, or incentives to internalise embodied emissions, manufacturers and developers lack the regulatory signal and market certainty necessary to shift production toward lowcarbon alternatives at scale.

These limitations mean that circular interventions that would deliver sustained operational savings—such as repurposing existing stock or integrating building systems for longevity—remain marginal because the regulatory and financial mechanisms for scaling them are incompletely developed.

Case Study 4: Thermal-modernisation project / Energy efficiency

The primary goal of the “Thermal Modernization of Multi-Apartment Residential Buildings in Astana” project is to reduce greenhouse gas emissions by improving the energy efficiency of buildings and their engineering infrastructure. The project was implemented with the support of the UNDP-GEF, the Mayor’s Office of Astana and the Ministry of Construction. The project demonstrates circular economy principles by modernizing facades, installing automated heat substations, and implementing energy-efficient lighting, which extends the lifecycle of buildings and minimizes resource consumption. Together, the intervention reduced heat losses by 31% and lighting electricity use by 71%, delivering an annual CO₂ reduction of 604 tonnes. Circular-economy practices are evident in material choices (durable, highperformance façade systems and insulated polyurethane piping), repurposing of dismantled elements where feasible, and a service-oriented delivery model that aligns lifecycle costs with performance outcomes. An innovative financing mechanism, through an energy service company (ESCO) enabled the financing of this modernization while reducing financial burdens on property owners by using future energy savings to fund improvements. Technical innovations—outdoor temperature-responsive heat regulation and remote resource monitoring for prompt leak detection—optimise operational efficiency and reduce wasteful energy flows. Social and economic cobenefits included improved resident comfort and lower utility bills, though implementation highlighted barriers: retrofitting legacy Soviet heating infrastructure required substantial engineering adaptation, materials price inflation strained budgets, and cofinancing demands generated resident resistance. Key lessons for replication are the importance of resident engagement, blending international technical standards with local practice, and embedding finance through performance-based contracts to sustain circular, energy-efficient building transitions.

Waste management in construction

Kazakhstan possesses a multilevel waste regulatory framework—the Environmental Code, ST RK 37922022 for construction waste, sectoral technical regulations and licensing requirements—that frames construction waste prevention, sorting and reuse. Yet practical barriers remain: limited recycling and processing infrastructure, low rates of source separation on site, weak enforcement and insufficient incentives for high-quality material recovery. Standard ST RK 37922022 provides necessary technical provisions, but without parallel investment in reverse logistics, certification pathways for secondary materials and binding procurement for reused content, recovered streams often default to low-value crushing or landfill. Thus, regulatory coverage exists but is not yet translated into operational circular value chains.

- **Reuse of Materials:** Current frameworks inadequately address the reuse of construction materials. While certain standards exist, such as those for recyclable concrete and metal, broader implementation remains limited. Suggestions for improving this include mandatory recycling protocols for demolition projects.
- **Construction Waste Management:** Legislative acts such as the Environmental Code regulate construction waste management. These include requirements for waste sorting, recycling, and the development of waste management plans by construction companies. Despite these measures, enforcement remains inconsistent, leading to gaps in effective waste management.

Case Study 5: GLB / Modular and Prefabricated Construction

The GLB⁸ project is the largest plant in Kazakhstan specializing in the production of precast concrete elements for industrial housing construction. Its primary goal is to implement innovative methods of industrial production for multi-apartment residential complexes, ensuring high quality and energy efficiency in construction. The GLB project integrates technologies that reduce energy and resource consumption. For instance, the use of low-temperature concrete curing reduces energy costs by 50%, while thermal insulation materials decrease energy losses by up to 70%. Additionally, the plant sources 90% of its raw materials from local suppliers, which supports the regional economy and reduces transportation costs.

The project ensures high-quality housing, energy efficiency, and a reduced carbon footprint through the use of modern production technologies. The project is located in Astana, Kazakhstan, on a 15-hectare site. Its geographical significance lies in advancing industrial construction in Central Asia and supporting the regional housing market through modern construction methods. Their key stakeholders include:

- Shar-Kurylys LLP – the parent company and project initiator.
- Weckenmann, Teka, EVG – equipment and technology suppliers.
- The Government of Kazakhstan – provides support for the project under the national “Business Roadmap 2020” program.

The plant has implemented processes that minimize waste and energy consumption, such as the use of textured matrices for facades and 3D modeling technology. These innovations extend the lifespan of buildings and reduce operational costs, aligning with the principles of sustainable construction. The project uses local resources, reduces its carbon footprint, applies modern thermal insulation technologies, and lowers energy costs during both production and building operation. These attributes make it a benchmark for circular economy practices in the construction industry.

Defining green building characteristics and standards

Kazakhstan has introduced different options for promoting “green” buildings: for example, the legal recognition of Best available Technology (BATs), energy efficiency laws, financial products (green mortgages), the development of a green taxonomy, National Green Building Standard - (OMIR), and the support of institutional actors such as Kazakhstan Green Building Council (KazGBC) that promote green construction. The recently established green taxonomy applies to projects in several categories – one dedicated to green buildings as such, but related, also renewable energy, energy efficiency, pollution prevention and control as well as sustainable water use and waste could be of relevance to sector stakeholders.

8 <https://glb.kz/>

Categories of “green” projects according to the Green Taxonomy of the Republic of Kazakhstan

	Renewable energy Wind, solar, geothermal, hydro, bioenergy, renewable energy supply chain and supporting infrastructure, hydrogen production
	Energy efficiency Improving energy efficiency at current or under construction industrial facilities, improving energy efficiency in the public and utility sectors, and constructing energy-efficient buildings, structures, and facilities
	Green buildings Green buildings, related systems and materials, and green infrastructure
	Pollution prevention and control Air quality, soil
	Sustainable water use and waste Sustainable water use and conservation, waste and wastewater, resource conservation and recovery
	Sustainable agriculture, land management, forestry, biodiversity conservation, and ecotourism
	Clean transport Clean transport, low-carbon vehicles, clean transport infrastructure, ICT for clean transport

Source: AIFC / GFC, 2024

The government promotes awareness of green construction through seminars, training sessions, and conferences. KazGBC plays an important role in educating stakeholders about sustainable construction practices and promoting certifications like LEED, BREEAM, OMIR. However, awareness among developers and construction firms remains low, necessitating enhanced outreach efforts.

Despite this, uptake is limited by fragmented access to finance (notably for SMEs), limited market awareness, and higher upfront costs of green buildings relative to short-term developer horizons. The current policy initiatives support lighthouse projects and state-backed schemes rather than broad market transformation. To embed circularity, incentives must be reconfigured to cover the distinct transaction costs of reuse, refurbishment and material traceability alongside energy performance, and to broaden access to finance and technical assistance for smaller market actors.

Case Study 6: Ergodom - building an organic house

A significant concept for circular building design was demonstrated by Ergodom⁹ project (Almaty), the first organic house in Kazakhstan. The main goal of the project is to minimize the carbon footprint, enhance energy efficiency, ecological sustainability, and improve the comfort of users by implementing sustainable construction and operational technologies. This building has been certified under the “OMIR - Office Buildings” standard (Kazakhstan Green Building Standard) by the KazGBC. The project focuses on the extensive use of local, renewable, and organic materials (straw, reed, wood), waste management, and the implementation of energy- and water-efficient solutions. These approaches align with the key principles of the circular economy, including waste reduction and resource efficiency.

The Ergodom project serves as a model for sustainable construction in urban design concepts and solutions for challenging climates and location as exemplified in Kazakhstan. Its approaches can be adapted to various conditions, considering local specifics.

In addition to the green building initiatives, Kazakhstan has established policies and standards that can enable circularity, including energy efficiency targets, environmental legislation, construction waste standards and green certification systems. However, substantive integration is hindered by implementation gaps: regulation is not always enforced, there is limited reverse logistics infrastructure, and urban expansion models privilege new, material intensive construction. Financing programmes generally favour large or state projects.

Creating sustainable cities

Beyond singular buildings, a circular economy approach also provides a framework for designing and managing cities in a more sustainable way (Ellen MacArthur Foundation, 2019). By reducing waste, promoting resource efficiency, and extending the lifespan of materials and products, a circular economy can help to create more resilient and sustainable urban environments. For example, green spaces are integral to a circular economy (Zhang / Qian, 2024) as they provide ecosystem services that contribute to the overall health and well-being of a city. Green spaces can also capture rainwater and prevent runoff, which can reduce pollution and erosion. They can also promote resource efficiency by providing shade, which can help to reduce energy consumption in buildings. Additionally, green spaces can extend the lifespan of infrastructure by absorbing pollutants and reducing the impact of extreme weather events.

9 <http://ergodom.kz/en>

Case Study 7: Greenery Charter of Astana City

The Greenery Charter of Astana City (Rakhmasheva, 2023), developed by the Center of Urbanism of Astana, is a comprehensive plan aimed at promoting sustainable urban design through the creation and maintenance of green spaces. This charter establishes principles and mechanisms to regulate greening, conserve natural resources, and enhance the quality of life for Astana's population. The initiative seeks to transform Astana into a garden-city within five years, as directed by the current President of Kazakhstan. Astana faces rapid urbanization, with intensive development of residential and commercial properties leading to a deficit of green areas. Although construction companies meet the 20% greening requirement, the quality of vegetation is often poor. Additionally, outdated standards and restrictions limit builders from greening areas beyond their allocated territories, even if they wish to contribute to adjacent public spaces.

To address these challenges, the city plans to follow a polycentric development model, establishing public spaces, parks, and boulevards in proximity to residential areas. Businesses are encouraged to finance tree planting along streets if they cannot meet greening requirements within their properties. New green spaces have been added, including public parks and squares near landmarks. A new technical water supply system for irrigation is being introduced to ensure that green areas are regularly maintained. The principle of soil permeability will be enforced to manage stormwater effectively and prevent flooding.

Land use of buildings and built environment

Land governance instruments—the Land Code, urban planning and master plans, the Green Economy Concept and mandatory environmental expertise—embed principles of rational land use and environmental protection. Nevertheless, current urbanisation patterns combine rapid peripheral expansion with monocultural construction practices that reduce opportunities for infill, adaptive reuse and densification—key circular strategies that preserve embodied resources. Master planning often prioritises new construction and infrastructural extension; environmental expertise tends to regulate impacts rather than mandate reuse or minimum impact site design. Consequently, land use policy provides a framework but insufficient positive requirements or incentives to prioritise circular land use outcomes in municipal decisionmaking.

Key regulatory initiatives

- Environmental Code (2021): Mandates adherence to environmental safety measures, encourages the adoption of Best Available Technologies (BAT), and addresses the reuse and recycling of construction materials. The Environmental Code establishes requirements for environmental impact assessments (EIAs) for construction projects and emphasizes waste management practices aimed at minimizing ecological harm.
- Law on Energy Conservation and Energy Efficiency (2012): Sets requirements for energy conservation, assigns energy efficiency classes for buildings, and mandates the development of energy-efficient designs. Notable challenges include the inconsistent application of updated energy efficiency classifications and the lack of economic incentives for designers and developers.
- Draft Construction Code: Although it emphasizes energy efficiency, it has faced criticism for lacking explicit measures on circular economy principles, such as waste minimization and material reuse. For example, while the concept of “Post-utilization of a Construction Object” is mentioned, detailed guidelines for recycling and reuse of materials are absent.
- Technical Standards (e.g., ST RK 3792-2022): Establish requirements for construction waste management, including sorting, recycling, and reuse. The standard aims to promote secondary use of construction waste while excluding hazardous waste categories.

5. Capacities and capabilities assessment

Both national contractors and material suppliers in Kazakhstan possess significant potential to promote circular economy principles in construction, and the opportunities for circularity mentioned above can be matched to build on stakeholders' strengths and provide support for overcoming respective weaknesses.

Contractors

Strengths:

- **Growing Awareness:** Contractors increasingly recognize the benefits of modular construction and reuse of materials, particularly in large urban areas like Astana and Almaty. Awareness campaigns by organisations like the Kazakhstan Green Building Council (KazGBC) and partnerships with international bodies have been instrumental in this shift. The survey noted that while contractors are aware of circular economy principles, their practical application remains at an early stage.
- **Adoption of Sustainable Practices:** Several contractors are integrating energy-efficient technologies into their projects, such as automated heating systems and renewable energy solutions. These technologies are increasingly prioritized in urban areas where demand for green buildings is rising. For instance, one survey participant mentioned the use of solar collectors and heat pumps in recent residential projects as a step towards aligning with circular economy principles.
- **Expertise in Large-Scale Projects:** National contractors have demonstrated competence in executing complex construction projects, including infrastructure development and public buildings. Examples include urban renewal projects and energy-efficient building developments supported by international organisations. Respondents in the stakeholder survey highlighted successful pilot projects in Astana and Almaty, where energy-efficient technologies were implemented, leading to significant reductions in operational costs and carbon footprints.

Weaknesses:

- **Limited Knowledge of Circular Practices:** While awareness is growing, contractors often lack the technical expertise to implement circular economy principles fully. For instance, modular construction and reverse logistics remain underutilized. Only 30% of survey respondents indicated that they consider the future adaptability or repurposability of buildings during the design phase.
- **Dependence on Outdated Standards:** Many contractors still rely on older regulatory frameworks that do not prioritize sustainability or circular practices, creating inconsistencies in project delivery. The survey revealed that many experts feel these outdated standards hinder innovation and adoption of sustainable practices.
- **Need for Training and Capacity Building:** There is a critical need for professional development programs to educate contractors on advanced circular practices, such as recycling construction waste and incorporating long-lasting materials into projects. Over 40% of respondents identified the lack of training as a primary barrier to implementing circular economy principles.

Opportunities for Improvement:

As mentioned in the previous section, capacity building would require a concerted effort across public and private sector actors, including associations and academia. For this to be taken up, the government should provide financial incentives for contractors who adopt sustainable practices, for example through tax breaks or targeted subsidies for the use of recycled materials. Regulators should also strengthen requirements mandating circular practices in all publicly procured construction projects, embedding reuse, recovery and material-efficiency criteria into tendering and contract performance, with infrastructure projects, public buildings or social housing programmes being potential testing ground.

Material Suppliers

Strengths:

- **Availability of Local Resources:** Kazakhstan's rich mineral resources provide an advantage for local suppliers in producing construction materials. Suppliers are also beginning to explore innovative practices, such as producing building materials from waste. For example, a startup mentioned in the survey has successfully developed bricks and tiles using recycled construction waste, demonstrating the potential for scaling these initiatives.
- **Increasing Eco-Friendly Products:** Some suppliers are offering energy-efficient and environmentally friendly materials, such as insulation products and energy-saving windows, contributing to sustainable construction efforts. Survey participants noted that such materials are particularly in demand in regions with extreme climates.
- **Cost Advantages:** Locally sourced materials often have cost benefits compared to imports, making them an attractive option for contractors aiming to reduce project costs while promoting sustainability. Approximately 50% of respondents agreed that local suppliers are competitive in terms of price and availability.

Weaknesses:

- **Supply Chain Dependencies:** Dependence on imported components for certain materials, such as advanced insulation or high-performance building systems, limits local suppliers' ability to meet the growing demand for sustainable materials. Survey participants identified this as a significant barrier to expanding the use of green materials.
- **Insufficient Recycling Infrastructure:** Although some suppliers are innovating with waste-based materials, the lack of comprehensive recycling systems hinders large-scale adoption of circular practices. For example, only 20% of respondents reported that their organisations actively recycle construction waste into new materials.
- **Lack of Standards and Certifications:** Many suppliers lack certifications for green materials, which undermines their competitiveness in both local and international markets. The survey revealed that less than 10% of suppliers possess internationally recognized green certifications.

Opportunities for Improvement:

As mentioned above, several measures would improve the contributions by material suppliers towards circularity. Regional recycling facilities to produce secondary raw materials would be a prerequisite for reuse, recycling, and remanufacturing of materials—such as concrete and metals—while establishing a national certification system for green materials to assure quality and promote wider adoption. Simultaneously, partnerships between domestic suppliers and international good practice agents (businesses, academia, organisations) would facilitate the transfer best practices in circular material production, supporting technology uptake, standards alignment and market credibility. These measures together would strengthen supply chains, reduce reliance on virgin resources and enable scalable, verifiable circularity in construction.

Using infrastructure projects for bringing forward circularity approaches

A key use case for improving the capacities and capabilities of contractors and material suppliers on circularity in Kazakhstan lies in its large infrastructure projects, including under the aforementioned “Nurly Zhol” and “Nurly Zher” initiatives. When integrating circular economy considerations in infrastructure development and construction operations, these can provide valuable lessons for improving circular economy implementations and contribute to the upskilling of contractors and suppliers, while building understanding for key concepts among all sector actors.

Therefore, large infrastructure projects, while often associated with large-scale resource consumption and environmental impact, can also play a crucial role in promoting a circular economy. These projects have long planning phases that would allow for integration of circularity, and are also less focused on commercial gain;

they are also usually less prone to changes, which often lead to improvised solutions. Yet, given their large scale and also the predominance of large firms, they can be resistant to change (O’Leary et al., 2024). This resistance can hinder the adoption of circular principles. However, if they are designed well by adopting circular strategies from the onset (such as design for circularity (DfC) and design for deconstruction (DfD)), these projects can offer unique opportunities for material circularity. By supporting CE initiatives, while promoting the use of advanced technology, they can enhance professionals’ awareness and strengthen the market for circular approaches (Alotaibi et al., 2024). By incorporating circular economy principles, infrastructure projects provide an important opportunity regarding waste reduction, resource efficiency, and extending the lifespan of built assets. The innovation and technological advancement that these projects enable can also be applied to other sectors, contributing to the development of new industries and business opportunities and promoting a more circular and sustainable economy. Moreover, large infrastructure projects can create numerous jobs and stimulate economic growth.

Case Study 8: Astana LRT - Infrastructure Projects

The Light Rail Transit (LRT) project in Astana was started as a showcase of sustainable urban development. Valued at more than USD 1.8 billion, the project focuses on energy efficiency and reducing carbon emissions, thereby seeking to contribute to a more sustainable urban environment. The chosen contracting model used for the project allows for greater control over its design, materials, and construction processes, offering potential opportunities for incorporating circular economy elements. Even though receiving significant funding and government oversight, the project has faced delays and cost overruns.

This underscores the importance of careful planning, execution, and adherence to circular economy principles in large-scale infrastructure projects. The project’s challenges and changes in leadership have resulted in significant financial burdens for Kazakhstan. The government has had to allocate substantial funds to keep the project running and negotiate foreign loans and issue bonds to secure continuation. It has also had negative environmental and social consequences, during construction and financing delays, due to its large scale. The unfinished structure was problematic, as it contributed to pollution and raised safety concerns. The project’s delays have also disrupted the lives of residents and commuters, causing inconvenience and frustration. The decision to halt funding was a clear signal to improve previous handling, and its mode of continuation was for some time unclear; however, it is now being finalised.

The LRT project in Astana offers valuable lessons for future infrastructure projects in Kazakhstan and other countries. These lessons include the importance of thorough planning and feasibility studies, adherence to project timelines and budgets, effective project management, and prioritization of sustainability. By learning from the challenges of the LRT project, Kazakhstan can ensure that future infrastructure projects are executed more effectively and sustainably. By prioritizing circular economy principles, the country can create a more sustainable and resilient built environment for its citizens.

6. Circularity analysis: 10 R principles and cases

Implementing the 10R circularity framework across projects revealed a set of consistent challenges and pragmatic solutions. Technological barriers arose where certified ecofriendly materials were scarce, as seen in the Ergodom project; the team responded by partnering with KazGBC to validate local alternatives such as straw, enabling greenbuilding certification. High upfront costs impeded adoption: BI Group's substantial investments in the Modex factory and ongoing R&D, alongside Ergodom's specialised technologies, increased project budgets. To overcome this, projects emphasised lifecycle economic arguments— Thermal Modernisation demonstrated longterm savings from reduced heating demand, reframing investment as costeffective over time. However, there was also some resistance regarding its ESCO scheme where property owners were sceptical about cofinancing; targeted communication of returns and tailored financing models helped build trust. Regulatory hurdles constrained innovation in Respublica, where compliance with building standards limited unconventional circular solutions; teams pursued early engagement with regulators and documented performance data to justify alternative approaches. Crosscutting solutions included strategic partnerships with international technology providers, and capacity building through training of local workers (Ergodom, GLB), which reduced implementation risk and improved material handling for reuse, repair, remanufacture and repurposing. Collectively, these measures demonstrate that aligning technical validation, economic incentives, stakeholder engagement and regulatory dialogue is essential to advance the 10R agenda in construction.

Case study mapping with possible CE implementation strategies (10R).

R0: Refuse, **R1:** Rethink, **R2:** Reduce, **R3:** Reuse, **R4:** Repair, **R5:** Refurbish, **R6:** Remanufacture. **R7:** Repurpose, **R8:** Recycle, **R9:** Recover

✓ First order effect, direct impact | (✓) Second-order effects, e.g, by making waste costly or raising awareness

Case Study	R0	R1	R2	R3	R4	R5	R6	R7	R8	R9
Astana LRT		✓	✓	✓					✓	
BI-Group R&D	(✓)	✓	✓	✓	✓	✓	✓	(✓)	✓	✓
Ergodom	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GLB	✓	✓	✓	✓	✓	✓		✓	✓	
Greenery Charter of Astana	(✓)	✓	✓	✓			✓	✓		
Modex	✓		✓	✓	✓	✓		✓	✓	
Respublica	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Thermal modernisation of residential buildings	(✓)	✓	✓	✓	✓	✓				

Across the cases, the 10R principles have been integrated to enhance sustainability and resource efficiency.

- **Refuse:** The “Ergodom” project avoided materials with harmful chemicals like asbestos and mercury, while the thermal modernisation initiative rejected outdated heating systems in favour of energy-efficient solutions.
- **Rethink:** The “Respublika” project employed a “city within a city” concept to minimize transportation emissions through integrated infrastructure. Similarly, the GLB plant rethought production for efficient material use.
- **Reduce:** The “Respublika” project implemented energy-efficient windows and insulated materials, reducing resource consumption. In Astana’s residential modernization project, thermal insulation and automated heating systems significantly reduced energy consumption, contributing to long-term savings and lower carbon emissions. In the Modex case, construction waste is reduced through concise prefabrication.
- **Reuse:** Construction waste was partially reused in landscaping in the “Ergodom” project, while modular construction methods in GLB enabled component reuse.
- **Repair and Refurbish:** Modernization efforts in the “Thermal modernisation” project emphasized repairing existing heating systems to extend their lifespan.
- **Remanufacture and Repurpose:** BI Group R&D seeks to employ all strategies. Respublika includes manufacturing considerations and repurposing.
- **Recycle:** The “Ergodom” project established systems for separate waste collection, facilitating recycling of paper, glass, polymers, and electronic waste.
- **Recover:** Only BI-Group R&D among the cases would consider recovering of energy content.
- **Renew:** “The “Greenery Charter of Astana City” and “Respublika” actively integrate nature-based solutions and biodiversity through green spaces and planting of trees and local flora.

These projects showcase how thoughtful application of the 10R principles, combined with stakeholder engagement and innovation, can address challenges and advance sustainability in construction.

Connecting the cases to insights

Kazakhstan stands at an important juncture: the construction sector is both a driver of economic growth and the building and construction sector is the country’s largest energy consumer. This dual role positions it as a central actor in the transition to sustainability. The experience of pilot projects shows that circular practices can be technically and economically viable.

1. Using momentum for Energy Efficiency:

Projects like “Thermal modernisation” and the implementation of automated heating systems in the ESCO initiative illustrate the potential of energy-saving measures to achieve both environmental and economic benefits. These initiatives collectively reduced heat losses by up to 31% and demonstrated annual cost savings for residents.

2. Innovative Practices:

- The GLB project leveraged modular construction and Building Information Modeling (BIM) to optimize material use, minimize waste, and reduce carbon footprints.
- “Gate City” demonstrated the effectiveness of integrated zoning, combining residential, educational, and recreational facilities to reduce transportation emissions.
- “Ergodom” showcased the use of renewable materials like straw and reed while enhancing biodiversity through endemic plantings.

3. Circular Waste Management:

- Projects like “Ergonomika” and “Gate City” highlighted the importance of organized waste collection and recycling systems. These efforts diverted significant volumes of construction waste from landfills and repurposed materials for secondary use.
- Recycling initiatives in the GLB project turned production waste into new building materials, exemplifying resource recovery at scale.

4. Policy Opportunities:

- Streamlined regulations can accelerate the adoption of sustainable practices. The introduction of green certifications, such as OMIR, has already begun influencing market behaviour.
- Pilot projects demonstrated the importance of government support, including public procurement policies favouring low-carbon and recyclable materials.

5. Stakeholder Engagement:

Collaborative approaches involving contractors, policymakers, and community members enhanced project success. Awareness campaigns, as seen in the “Gate City” project, played a crucial role in fostering public support for circular initiatives.

7. Overall assessment and conclusion

Current State of Circular Economy Practices in the Construction Sector

Kazakhstan's construction sector has demonstrated notable, though uneven, progress in adopting circular economy (CE) principles. Energy-efficient building designs, selective waste reduction measures, and modular approaches are gaining visibility, particularly in urban centers like Astana and Almaty, where pilot projects have showcased measurable benefits. Nevertheless, systemic challenges—fragmented regulations, limited incentives, low awareness among practitioners, and insufficient recycling infrastructure—continue to hinder mainstream adoption.

The fragmentation across thousands of contractors, specialized trades, and installers complicates coordination of CE practices throughout the building lifecycle, from design for disassembly to post-occupancy material recovery, and weakens demand aggregation for secondary materials. Recent initiatives, such as the thermal modernization of multi-apartment housing in Astana, illustrate a gradual shift from linear practices toward more sustainable models, reducing energy losses and demonstrating the value of green retrofitting. Yet, the absence of standardized methodologies for embodied and operational carbon assessment, together with the inconsistent application of green building certifications such as OMIR, remains a critical barrier to scaling.

It is also evident that circularity-related priorities—construction waste management, secondary materials markets, and design-for-reuse—are often overshadowed by immediate concerns such as project delays, rising material costs, and shortages of skilled labor. These short-term pressures reduce the incentives and capacity of developers to adopt long-term sustainability measures.

Bridging these gaps will require targeted regulatory instruments (material accounting and procurement mandates), scaled investments in sorting and processing infrastructure, municipal planning reforms to prioritise reuse and densification, and tailored financial instruments and capacity building for SMEs to absorb the upfront costs of circular practice.

On this basis, the following points have emerged as insights from the cases and further analyses of the report that would help guide a more strategic approach to anchoring circular economy principles into the sector:

- **Energy efficiency as an entry point:** Energy retrofits and green standards (e.g., OMIR) have emerged as the most effective drivers of CE integration, with measurable savings and growing acceptance among stakeholders.
- **Regulatory fragmentation as a bottleneck:** More than 2,500 overlapping norms and the absence of a unified Construction Code create complexity, legal ambiguity, and discourage experimentation with CE practices.
- **Address Waste Management Gaps:** Despite regulatory frameworks like the Environmental Code, the lack of robust recycling facilities and clear guidelines for material reuse presents a critical gap. This highlights the need for a comprehensive waste management infrastructure.
- **Financial instruments as enablers:** Green bonds, loans, and mortgages promoted under the national taxonomy and Otbasyl Bank provide a clear pathway to mobilize capital for CE-aligned projects, but uptake is still limited.
- **Capacity and skills gap:** A shortage of trained professionals in modular construction, waste management, and lifecycle design constrains sector-wide implementation and highlights the need for large-scale training initiatives. Professional training programs and public awareness campaigns can bridge knowledge gaps and equip stakeholders with the tools to implement advanced circular practices.
- **Data and monitoring deficit:** Reliable statistics on construction and demolition waste, secondary raw materials, and embodied carbon are missing, making it difficult to track progress and build investor confidence.

Finally, the cases also demonstrate that there is interest for integrating circularity considerations in the sector, but there is lack of momentum: Lighthouse projects prove technical feasibility, and, partly, a business case; but systemic barriers prevent scaling. Without stronger incentives and enforcement, CE will remain confined to pilots rather than becoming a sector-wide norm.

Therefore, the main priorities for the future include: (i) adopting a unified Construction Code that integrates CE requirements; (ii) scaling financial instruments and incentives for green projects; (iii) investing in training and capacity-building across the sector; and (iv) strengthening data, monitoring, and certification systems.

If these steps are taken, Kazakhstan's construction sector can become a regional leader in circular practices, reducing its environmental footprint while enhancing economic resilience and competitiveness.

References

- Agency for Strategic Planning and Statistics of the Republic of Kazakhstan (2023): Construction statistics, commissioning and volume of construction works. <https://stat.gov.kz/en/industries/business-statistics/stat-inno-build/publications/183368/>
- AIFC (Astana International Financial Centre Authority) (2022): The AIFC Green Finance Centre is involved in the promotion of the Sustainable Development Goals in Kazakhstan: <https://aifc.kz/news/zhasyl-arzhy-ortaly-y-aza-standa-t-ra-ty-damu-ma-sattaryn-ilgeriletuge-atysady/>
- AIFC (Astana International Financial Centre Authority) (2024): Commercial real estate and REIT prospects, including commissioning figures for offices, malls and warehouses: <https://aifc.kz/wp-content/uploads/2024/09/kazakhstan-commercial-real-estate-and-the-prospects-of-the-reit-market.pdf>
- AIFC / GFC (Astana International Financial Centre Authority / Green Finance Centre) (2024): Green finance market in Kazakhstan: <https://aifc.kz/wp-content/uploads/2024/07/3.3-green-finance-market-of-kazakhstan.pdf>
- Akinradewo, Opeoluwa, Aigbavboa, C., Aghimien, D., Oke, A., & Ogunbayo, B. (2021). Modular method of construction in developing countries: the underlying challenges. In: International Journal of Construction Management, 23(8), 1344–1354. <https://doi.org/10.1080/15623599.2021.1970300>
- Alotaibi, Saud, Pedro Martinez-Vazquez, and Charalampos Baniotopoulos (2024): Advancing Circular Economy in Construction Mega-Projects: Awareness, Key Enablers, and Benefits—Case Study of the Kingdom of Saudi Arabia. In: Buildings 14, no. 7: 2215. <https://doi.org/10.3390/buildings14072215>
- Assylbekov, Daniyar & Nadeem, Abid & Hossan, Md & Akhanova, Gulzhanat & Khalfan, Malik. (2021): Factors Influencing Green Building Development in Kazakhstan: https://www.researchgate.net/publication/356917278_Factors_Influencing_Green_Building_Development_in_Kazakhstan
- Bello, Abdulkabir Opeyemi, Doris Omonogwu Eje, Abdullahi Idris, Mudasiru Abiodun Semiu, Ayaz Ahmad Khan (2024): Drivers for the implementation of modular construction systems in the AEC industry of developing countries. In: Journal of Engineering, Design and Technology 22 November 2024; 22 (6): 2043–2062. <https://doi.org/10.1108/JEDT-11-2022-0571>
- CCS (Central Communications Service under the President of the Republic of Kazakhstan) (2023): Adoption of industry code will solve systemic problems of construction industry - Ministry of Industry and Infrastructure Development: <https://ortcom.kz/ru/novosti/1683952030>
- Durdyev, S., Kerim Koc, Aidana Tleuken, Cenk Budayan, Ömer Ekmekcioğlu and Ferhat Karaca (2025): Barriers to circular economy implementation in the construction industry: causal assessment model. In: Environ Dev Sustain 27, 4045–4081 (2025). <https://doi.org/10.1007/s10668-023-04061-8>
- Ellen MacArthur Foundation (2019): Cities and the circular economy – deep dive. <https://www.ellenmacarthurfoundation.org/cities-and-the-circular-economy-deep-dive>
- ESCAP – Infrastructure financing and overview of Nurly Zhol / Nurly Zher programmes (2020, contextual but still referenced in national planning): <https://www.unescap.org/sites/default/d8files/event-documents/Infra%20financing%20Kazakhstan%20final.pdf>
- EY – Investment attractiveness survey and FDI trends (2024/2025): <https://www.ey.com/content/dam/ey-unified-site/ey-com/en-kz/newsroom/2025/documents/ey-kazakhstan-investment-attractiveness-survey-2024.pdf>
- GlobalData (market report; paywalled) – Kazakhstan construction market segmentation and pipeline overview (summary page): <https://www.globaldata.com/store/report/kazakhstan-construction-market-analysis/>
- Green Taxonomy Kazakhstan (2022): Green Taxonomy Kazakhstan, <https://www.greenfinanceplatform.org/sites/default/files/2022-05/Green%20Taxonomy%20Kazakhstan.pdf>

- IMF – country economic report and sectoral notes on construction and oil dependence (2024): <https://www.imf.org/-/media/Files/Publications/CR/2024/English/1KAZE2024001.ashx>.
- Jibek Joly (2021): Innovations in Construction: Eurocodes and Seismic Safety: <https://jityv.kz/ru/innovatsii-v-stroitelstve-evrokody-i-sejsmbezopasnost>
- JP-KZ: Deloitte (Japan-Kazakhstan Network for Investment Environment Improvement) (2023): Construction materials market and regional production concentration: https://jp-kz.org/wp/wp-content/uploads/ENG_23_%D0%9E%D0%A2_ConstructionMaterials.pdf
- Karaca, Ferhat and Aidana Tleuken (2023): Reforming Construction Waste Management for Circular Economy in Kazakhstan: A Cost–Benefit Analysis of Upgrading Construction and Demolition Waste Recycling Centres. In: Recycling, 9(1), 2: <https://www.mdpi.com/2313-4321/9/1/2>
- Karaca, Ferhat, et al. (2024): [Stakeholder perspectives on the costs and benefits of circular construction Scientific ReportsOpen source preview](https://www.nature.com/articles/s41598-024-81741-z), 2024, 14(1), 30039
<https://www.nature.com/articles/s41598-024-81741-z>
- KazDATA (2022): Market information in Kazakhstan. <https://www.kazdata.kz/30/service.html>
- KAZGOR (2025): Regulatory and executive documents website <https://www.kazgor.kz/en/serv/extra/norms-doc>
- KazNIIS (2025): Overview over Center for regulation in Construction <https://kazniisa.kz/centres/center-for-regulation-in-construction#1669554461941-e2161773-3407>
- Khoroshevskaya, Natalya (2021): Kazakhstan: laying the foundations for sustainable investment. Online article from Focus: <https://focus.world-exchanges.org/articles/kazakhstan-sustainable-investment>
- Levin, Alexander (2024): How the digitalization of the construction industry is going in Kazakhstan. News Article from Kursiv Media: https://kz.kursiv.media/2025-09-08/dnrm-migration-astana-tokayev/?utm_campaign=endless_feed
- Loginov, Ruslan (2024): Kazakhstan cannot provide itself with building materials at the moment. News article from Inbusiness.kz: <https://inbusiness.kz/ru/last/kazahstan-ne-mozhet-obespechit-sebya-strojmateriami-na-dannyj-moment>
- Ministry of Ecology and Natural Resources of the Republic of Kazakhstan (2023): National Report on the State of the Environment and Use of Natural Resources in the Republic of Kazakhstan for 2022. <https://www.gov.kz/memleket/entities/ecogeo/documents/details/566594?lang=ru&ysclid=m4dporx6il315137681>
- NCE RK (National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken”) (2024): Administrative Barriers in Construction: Expert Opinion: <https://atameken.kz/ru/news/53022-administrativnye-bar-ery-v-stroitel-stve-mnenie-ekspertov>
- OECD (2025): Measuring Green Finance Flows in Kazakhstan; Responsible Business Conduct for Sustainable Infrastructure in Kazakhstan (selected reports), <https://www.oecd.org>
- OECD (2023): Insights and contextual analysis of investment patterns and resource dependence. https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/05/insights-on-the-business-climate-in-kazakhstan_60af2af3/bd780306-en.pdf
- O’Leary, Matthew James, Mohamed Osmani, Chris Goodier (2024): Circular economy implementation strategies, barriers and enablers for UK rail infrastructure projects. In: Resources, Conservation & Recycling Advances, Volume 21, 2024: <https://www.sciencedirect.com/science/article/pii/S2667378923000676?via%3Dihub>
- OSDP – National Social Democratic Party (2025): <https://osdp.kz/ru/novost/chislo-stihijnyh-svalok-stroitelnyh-othodov-v-astane-dostiglo-700>
- QazaqGreen (2025): “Green” construction in Kazakhstan: a step towards a sustainable future and achieving the SDGs. <https://qazaqgreen.com/en/journal-qazaqgreen/industry-news/2492/>

- Qazindustry, JSC "Kazakhstan Industry and Export Center" (2019): Все права защищены. Использование материалов разрешается только при наличии активной гиперссылки на официальный сайт: <https://qazindustry.gov.kz/docs/otchety/1725945463.pdf>
- Rakhmasheva, Mereke (2023): Charter for landscaping of the city is planned to be created in the capital of Kazakhstan. News article from Inbusiness.kz: https://inbusiness.kz/ru/last/ustav-po-ozeleneniyu-goroda-planiruyut-sozdat-v-stolice-kazahstana?roistat_visit=111013
- Ranking.kz (2023): Construction Waste Inflow to Landfill decreased by a noticeable 74%: <https://ranking.kz/reviews/regions/postuplenie-stroitelnyh-othodov-na-zahoronenie-sokratilos-na-zametnye-74.html>
- Sabekov, Serik (2023): What building materials does Kazakhstan import? News article from Inform.kz: https://www.inform.kz/ru/kakie-stroitel-nye-materialy-importiruet-kazahstan_a4107936
- Torgautov, Beibut, Asset Zhanabayev, Aidana Tleuken, Ali Turkyilmaz, Mohammad Mustafa, and Ferhat Karaca (2021): Circular Economy: Challenges and Opportunities in the Construction Sector of Kazakhstan. In: Buildings, Volume 11: 501. <https://doi.org/10.3390/buildings11110501>
- UNECE (United Nations Economic Commission for Europe) (2018): Country Profiles on the Housing Sector: Republic of Kazakhstan. https://unece.org/sites/default/files/2022-01/CP_Kazakhstan_web.ENG_.pdf
- U.S. Department of State – Investment Climate Statements and FDI composition (2023): <https://www.state.gov/reports/2023-investment-climate-statements/kazakhstan>
- World Bank (2024): Circular Economy as an Opportunity for Central Asia. Summary Report. May 2024: <https://documents1.worldbank.org/curated/en/099052024074569900/pdf/P1708701a3dabb0e11b7b11feb6167f2ecb.pdf>
- Zhang, Fan and Haochen Qian (2024): A comprehensive review of the environmental benefits of urban green spaces. In: Environmental Research, Volume 252(2): <https://www.sciencedirect.com/science/article/abs/pii/S0013935124007412?via%3Dihub>
- Zhazetova, Zhanel and Gerard Stavrianidi (2023): Construction companies litter, and akimats clean up. How Astana turned into the capital of spontaneous landfills. News article from informburo.kz: <https://informburo.kz/fotoreportazh/musoryat-stroikompanii-a-ubirayut-akimaty-kak-astana-prevratilas-v-stolicu-stixiinyx-svalok>
- Zhumaqaziev, Arman and Dinarr Adilova (2024): Analysis of the Possibility of Effective Use of Construction Waste in Kazakhstan. In: International Scientific Journal 'VESTNIK NAUKI' No. 9 (78) Volume 5. <https://www.xn---8sbempclcwd3bmt.xn--p1ai/archiv/journal-9-78-5.pdf#page=352>



www.switch-asia.eu



EU SWITCH-Asia Programme
@EUSWITCHAsia



SWITCH-Asia
@SWITCHAsia



SWITCH-Asia Official
@switch-asia-official