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Circularity in the Building Sector

MONGOLIA

Acknowledgments

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Country Report Mongolia: Towards Sustainable and Circular Construction

This report aims to inform stakeholders of introducing circular and sustainable construction practices in Mongolia. Its primary purpose is to synthesize findings and insights from various reports, documents, and stakeholder discussions, to assess the current status of Sustainable Consumption and Production (SCP) and circular economy principles, and provide actionable approaches for the Mongolian construction sector. The report addresses the integration of circular economy principles across three key stages of the building lifecycle: materials (structural and operational); construction (and refurbishment) works; and deconstruction and demolition.

The report aims to provide information for the Mongolian government and other key stakeholders to develop and implement policies and strategies that align with both national socio-economic development goals and international environmental commitments, including decarbonizing the sector and contributing to climate change mitigation efforts. By doing so, it seeks to balance economic growth with environmental stewardship and pave the way for a sustainable future in Mongolia.

The scope of this report primarily focuses on the capital city, Ulaanbaatar, while examining the construction and building sectors within the broader context of Mongolia's national economy.

Methodology

Data collection and analysis approaches

Data sources comprised statistical databases and sector reports detailing energy use, emissions and related metrics, supplemented by desk research of government and organisational sites, media and social channels. Project documents and reports provided projectlevel insights, while expert consultations and stakeholder engagement in preparation and during the country visit contextualised policy development, implementation and operational challenges. Integrating these sources gives a consolidated view of the sector's state and circularity potential.

Identification and Engagement of Key Stakeholders

Key stakeholders were identified through the researcher's organizational network, and previous project collaborations.

Status of construction and use of residential buildings in Mongolia

As the world's most sparsely populated country, the capital of Ulaanbaatar stands out as Mongolia's dominant urban center, with more than 1.5 million inhabitants —nearly half of the country's total population. Mongolia has experienced decades of accelerating urbanization, with the urban population share climbing from 57 per cent in 2000 to close to 70 per cent in 2018. This has mainly been visible in its capital and main urban center Ulaanbaatar. The next largest cities, such as Erdenet and Darkhan, have populations below 100,000. Ulaanbaatar therefore is the political and economic hub. It is shaped by its fast urbanisation, and resulting infrastructure pressure, and environmental issues. At the same time, it receives most investment, while smaller cities are of limited influence and resources. This stark urban hierarchy shapes both national development priorities and the distribution of public services and opportunities across Mongolia. Another important factor to consider in the context of Mongolia is its challenging extreme climate, where temperatures plummet to -35°C in the long winter months, and the brief summers can be warm with temperatures well above +20°C. This amplitude would necessitate resilient and energy-efficient building practices. (SWITCH-Asia, 2020; GIZ, 2024; World Bank, 2024)

The construction sector's share of GDP is expected to reach 3.6 percent in 2023. This contribution is explained by the importance of the services (40%) mining (18%) and agricultural sectors (9%) (Statista, 2025) for the economy. There are more than 17.000 registered business entities in the sector, of which 8100 are

operating. The number of employees in the construction sector reached close to 80.000, an increase of 2300 or 3% percent from the previous year, reflecting the sector's expanding role in Mongolia's transition from a rural, agriculture-based economy to one driven by urbanisation and infrastructure development (National statistical office, 2024; GIZ, 2023). However, due to its climate, the work is highly seasonal with construction sites only operating in warmer months (on average three months, 90 days per year). Mongolia's construction sector is further notable for its reliance on imported building materials, and informal labour and work crews. Despite robust growth, the sector faces challenges related to skills shortages, new regulations and uneven regulatory enforcement, and the need for improved resource efficiency and sustainability (Privacy Shield, 2016; Switch to Green, 2023).

The sector is marked by a mix of large-scale public infrastructure projects, and investment in transportation, electricity, and mining sectors, with government investment and foreign direct investment playing a significant role. In the residential construction space, there are a multitude of smaller private developments, including in the high-price sector, but the most significant trend for nearly three decades has been the building of basic, wood frame houses in "ger" (yurt) areas. This has been propelled by the citizens right to their own land parcel for residence since 2008, with a maximum size limit of 700 m² in Ulaanbaatar, and larger plots in other urban areas.

Because of the nature of urbanisation, and the construction of basic dwellings by informal workers, urban areas in Mongolia are of low density, and basic urban services have not kept up. Rapid urban migration has increased demand for affordable housing in Ulaanbaatar, exceeding current supply, with a deficit of thousands of homes. In addition, there are poor living conditions in urban and peri-urban areas, particularly within the ger areas. (World Bank, 2024; quoting NOSK, 2019).

As mentioned above, due to Ulaanbaatar's overwhelming demographic and economic dominance, it is the focal point for urban development trends, regulatory change, and market transformation in the building sector. Additionally, the city faces acute sustainability challenges, including severe winter air pollution and a rapidly expanding informal housing sector, which have profound implications for national climate and health objectives. Furthermore, Ulaanbaatar acts as a testing ground for innovative policies and technologies, setting precedents that are often replicated across the country, thereby amplifying the impact of any interventions made within its building and construction sector.

Ulaanbaatar's urban landscape is defined by a mix of building types, each reflecting different historical periods and socio-economic dynamics. The most prominent categories include Soviet-era apartment blocks, modern high-rise developments, and the extensive ger areas, each facing distinct sustainability challenges. Ulaanbaatar's central district consists mainly of apartment blocks with full utility services, such as centralized district heating, piped water, and wastewater treatment. Encircling this is a peri-urban "ger area", housing roughly 800,000 people—60% of the city's population. Predominantly occupied by low- and middle-income rural migrants who came after 2000, these neighbourhoods often lack adequate infrastructure, with irregular, unpaved pathways and loosely arranged plots.

Older buildings, especially the prefabricated concrete residential blocks in Ulaanbaatar, are poorly insulated and many are nearing the end of their lifespan; as an alternative to demolition, they would require significant investment for retrofitting or refurbishment. However, energy consumption is highly subsidised, with costs calculated by space rather than actual consumption, which reduces incentives for energy-saving investments. There is also a lack of widespread technical expertise and institutional capacity to implement large-scale retrofitting. Additionally, information campaigns and public motivation are still developing, and financing for energy efficiency upgrades remains limited.

An additional point of consideration for the sector is the significant seismic activity due to nearby active fault lines, causing tremors and quakes. While the last earthquake causing fatalities was in 1957, there have been four severe earthquakes since then, and more than 40 in the past 40 years. In response, Mongolia has updated its construction codes, but especially in ger areas, due to the low standard of construction, risks remain high. Therefore, circularity considerations should also include legislative and practical measures aim to enhance earthquake resilience, ensuring safer construction amid seismic risks. (Openquake, 2023).

Background information: Building typology in Ulaanbaatar

Soviet-Era (Socialist) Pre-cast panel Buildings (Угсармал)

Constructed primarily between the 1950s and 1980s, Soviet-era apartment blocks are concentrated in the city's central areas, structures that make up about 30% of Ulaanbaatar's residential building stock. These multi-story, prefabricated concrete buildings were designed for high-density living and equipped with centralised heating and basic infrastructure. However, decades of use have left them with inadequate insulation, inefficient heating systems, and deteriorating facilities. The result is high energy consumption, significant greenhouse gas emissions, and a pressing need for large-scale retrofitting to improve thermal performance and overall living conditions (Kurby, 2023; World Bank, 2024).

Ger areas

Ger areas are settlements that have grown rapidly on the city's periphery due to rural-to-urban migration, starting in the 1990s. Land in the ger areas is legally documented in accordance with the Law on Land and most dwellers in these areas hold official ownership status. The areas are characterised by largely informally built, simple and basic wooden houses. Lacking piped water, sanitation, paved roads, and central heating, residents rely on coal and wood stoves for heating, which is a major source of air pollution and carbon emissions during winter. Close to half of Ulaanbaatar's population now lives in ger areas, making their upgrading a critical urban and environmental challenge (Caldieron, 2013; Correct Mongolia, 2023; World Bank, 2024).

Modern Apartments and Commercial Buildings

Recent decades have seen a surge in modern apartment and commercial building construction, especially in central Ulaanbaatar and new development zones. These high-rise structures, often built with glass, steel, and imported materials, offer improved amenities and comfort. However, they can be resource-intensive both in construction and operation, and often lack designs tailored to Mongolia's extreme climate. Affordability is also a concern, as these buildings are out of reach for lower-income households (Kurby, 2023).

Transitional and Mixed-Use Areas

Some neighbourhoods are in transition, with traditional gers gradually being replaced by brick houses or small apartment blocks as infrastructure is upgraded. These areas often exhibit a patchwork of building types and qualities, reflecting uneven investment and planning capacity (Metropolis, 2020).

The Master Plan of Ulaanbaatar City Until 2040

The municipal government has implemented several long-term strategies. The latest "Master Plan of Ulaanbaatar City Until 2040" to the State Great Khural (the Mongolian Parliament) has moved through the parliamentary process towards approval. This new master plan has been in development since 2017 and represents a significant shift in strategy.

Key features of the Ulaanbaatar 2040 Master Plan include:

- A Multi or Poly-Centered City: It moves away from a single-core urban structure to a multi-centered model to make public services more accessible.
- Satellite Cities: The plan proposes the development of satellite cities and towns focused on specific sectors like culture, industry, and tourism to reduce population concentration in the capital.
- The "20-Minute City" Concept: A central concept of the new plan is to develop 14 new urban centers and sub-cities where residents can access essential services within a 20-minute walk or bike ride.
- Economic and Job Growth: It aims to create 193,000 new jobs.

This master plan until 2040 is also aligned with Mongolia's even broader, long-term national strategy called "Vision 2050," which was approved in 2020. Vision 2050 aims to develop Ulaanbaatar into a comfortable, environmentally friendly, and human-centered smart city.

Introduction to key concepts for bringing circularity to 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 (CDW) 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 CO_2 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

A key operational framework 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 through product-as-a-service, reuse and sharing models or by putting multi-functionality
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 and 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 conditiion).
R7	**Repurpose**	Use a redundant product or its parts in a new product with different function.

R8	**Recycle**	Recover materials from waste to be reprocessed 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) patterns within the built environment. The highest-order strategies—Refuse, Rethink, and Reduce—directly target the consumption nexus by enhancing resource efficiency during the design phase. This entails the application of advanced methodologies such as Design for Disassembly (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. 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.

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 or engineered structures	Material extraction, manufacturing, R&D	Construction works incl. logistics	Maintenance and Facility Management (Use Phase)	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)**
   This strategic stage offers the highest potential for circular impact by applying the principles of Refuse and Rethink. Instead of defaulting to new builds, planners can prioritize the adaptive reuse of existing structures.
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.

1. Key sustainability challenges and hurdles prohibiting circular practices

The Mongolian construction sector faces several key challenges in transitioning towards more sustainable and circular practices; this chapter will focus on three key stages in the building life cycle.

Material use and resource consumption, the operational use phase, and construction and demolition (C&D) waste together account for the greatest environmental, social and economic impacts in Mongolia's building and construction sector at present. Therefore, integrating circularity considerations into these stages would create momentum for the circular transformation of the sector not only in the long-term, but already today. Focusing on these three stages concentrates effort where circular strategies can most rapidly reduce emissions, resource extraction and social costs, while building resilient, locally adapted pathways for Mongolia's sustainable construction transformation.

Material extraction and material use determine the sector's upstream resource intensity, and part of its (embodied) greenhouse-gas emissions. Due to Mongolia's reliance on imports, they also shape supply-chain vulnerabilities given long transport distances, and are impacted by seasonal constraints. The use phase governs operational energy, water and indoor environmental quality over decades, directly affecting national energy demand profiles, household costs and occupant health—areas where efficiency improvements, refurbishment, renewable integration and adaptive design can deliver large, sustained benefits. Finally, C&D waste represents the unresolved downstream of both material choices and design practice: without systems for recovery, reuse and high-quality recyclates, valuable material stocks are lost, landfill burdens expand and greenhouse-gas savings from avoided primary production are forgone.

Considering these stages together enables integrated interventions—material substitution and circular design reduce embodied impacts and simplify end-of-life recovery; durable, maintainable buildings lower operational consumption and extend service life; and improved deconstruction and waste management close material loops while creating local circular economy opportunities.

1.1 Material use and circularity of inputs

Primary construction materials in Mongolia include concrete, cement, steel, brick, timber, and insulation products. The country is heavily dependent on imports for these materials, with estimates indicating that around 70% are sourced from abroad, predominantly from China; only about 30% of primary construction materials are produced domestically (Privacy Shield, 2016). Mongolia faces considerable challenges in reducing resource consumption and waste, and progress towards Sustainable Development Goal 12—responsible consumption and production—has been slow, with significant obstacles remaining (Switch to Green, 2021). Construction and demolition waste makes up a substantial share of Mongolia's total waste, accounting for 20–25% (Capacity4dev, 2020). Illegal dumping of construction waste is widespread, largely due to insufficient enforcement and gaps in waste management regulations (Capacity4dev, 2020).

Over the past decade, Mongolia's residential building sector has evolved from near-total dependence on foreign-sourced inputs to a mixed but still import-dominant supply structure. Cement illustrates the most advanced shift: domestic output rose from 1.098 million tonnes in 2019 to 1.714 million tonnes in 2023, a 56% increase that has displaced almost all cement imports, 99.9% of which still arrive from China on a value basis (National Statistics Office, 2023; Mongolian Customs General Administration, 2023). The total production of now seven cement plants was capped to avoid oversupply, having the capacity to produce 4.5 million tonnes annually (GogoNews, 2024).

The latest available data show that Mongolia imported iron and steel valued at approximately US$236.31 million in 2021 (Trading Economics, 2021) and metals in total at US$567.15 million in 2021 (WITS, 2024). Mongolia is expanding its domestic steel production capacity. The "Mongolian Steel Complex-I" project is designed to use domestic iron ore for cast steel products, with the aim of meeting over 50% of national steel demand and stabilising construction material prices (Montsame, 2023), 350,000 tons of steel products, there

will be a steel bar plant with an annual output of 643,000 tons,. The Darkhan Metallurgical Plant remains the largest steelmaker in Mongolia, demonstrating existing but limited domestic production capabilities (GEM Wiki, 2023).

Wood imports in 2022 were at US$201 million in 2022 (WITS, 2024) trade filings show Russia continuing as the dominant supplier of sawn wood. Quantitative data for bricks/blocks, aggregates, gypsum, glass, insulation, and plastics remain largely absent from official statistics. The National Statistics Office aggregates non-structural flows under a USD 1.1 billion "construction materials" headline figure for 2023 without specifying tonnage or material category (National Statistics Office, 2023).

In terms of reuse, repurposing, remanufacturing, and recycling of materials, technical, economic, and cultural barriers persist: SMEs lack certified processes, finance for recycling plants is scarce, building codes omit deconstructability criteria, and consumers distrust secondary materials (SWITCH-Asia, 2022). While Mongolia's residential material intensity (825 kg/m² in 2022) is lower than China (1,230 kg/m²) and Russia (1,105 kg/m²) it reflects predominantly linear consumption, with little end-of-life recovery (International Resource Panel, 2022).

Heavy reliance on imports in Mongolia's building sector presents both significant challenges and distinct opportunities for advancing material circularity. Because of its dependence on imported construction materials, there is only limited control over material standards and composition, as well as vulnerability to supply chain disruptions, and price volatility. This reliance can hinder the establishment of local recycling loops and complicate the implementation of circular strategies such as reuse, remanufacturing, and recycling, given the lack of infrastructure and knowledge transfer for handling imported materials. On the other hand, import reliance also creates leverage. Public and private buyers can stipulate recycled content, material passports and designfordisassembly in imported products and systems, accelerating downstream recovery and reuse. The necessity to import and its problems with regard to price volatility and potential disruptions, may also catalyse the development of local industries focused on material recovery and innovation, reducing imports over time and promoting economic diversification.

The challenges and opportunities of import reliance vis-a-vis circularity underscore the importance of long-term commitments and strategies to integrate circularity considerations into the sector.

1.2. Environmental impacts during use phase and beyond

The building sector in Mongolia is a significant contributor to national greenhouse gas (GHG) emissions, accounting for an estimated 43% of the country's energy-related emissions. This substantial share is attributed to Mongolia's harsh climate and its current poorly insulated building stock, which necessitates high energy consumption for heating. The emissions intensity is also due to coal as primary energy source for heating and the fact that more than half of Mongolian households need to burn coal directly, as they are not connected to central heating. Ongoing national targets aim to reduce building heat loss and increase energy efficiency to address this large share of emissions from the sector. As a result, the sector presents considerable potential for emissions mitigation through targeted interventions.

The current high environmental impacts through waste are largely driven by inefficient materials use and lack of a functioning framework for requiring circularity-driving strategies in the sector (see "10 R activities", above). Promoting circular economy efforts could provide solutions; as a starting point, there is a focus on recycling construction waste through the building of a CDW plan (Case 8), but many challenges still exist in terms of regulation, capacity and infrastructure regarding the improvement of material efficiency to reduce pollution, carbon emissions, and resource use.

Table: Environmental impacts per housing type

Type of Housing	Environmental impacts	Potential Solutions
Soviet-Era (Socialist) Apartment Buildings (Ugsarmal)	• Poor thermal insulation and high energy loss • Outdated heating, plumbing, and electrical systems • Financial and logistical barriers to retrofitting/refurbishment • Demolition may pose waste and pollution problems	• Large-scale retrofitting for insulation and energy efficiency • Modernisation of heating and utilities • Access to green finance and subsidies for retrofits • Circular demolition approaches and recycling of construction waste
Ger Areas	• Severe air pollution from coal and wood use • Lack of basic water, sanitation, and waste services, leading to pollution/ contamination • Exposure to climate extremes	• Introduction of clean heating technologies (e.g., electric, pellet, or district heating) • Infrastructure upgrades for water, sanitation, and waste • Climate-resilient and inclusive urban development • Skills upgradation of work crews and use of simplified green building standards
Modern Apartments and Commercial Buildings	• High embodied energy and carbon footprint of materials • Potential for urban heat island effects in summer • Limited integration of renewable energy solutions	• Adoption of green building standards and low-carbon materials • Urban greening and heat island mitigation • Integration of solar and other renewables • Policies to promote mixed-income and affordable housing
Transitional and Mixed-Use Areas	• Fragmented infrastructure and service provision, leading to pollution/ contamination • Difficulties in urban planning and land regulations • Mixed building quality and lack of cohesive urban design	• Integrated infrastructure planning • Urban design guidelines and land use reforms • Capacity building for local planners and participatory neighbourhood development

In addition to the operations of buildings, environmental challenges persist during their construction and demolition phases, including soil contamination. Elevated concentrations of heavy metals such as arsenic, zinc, and copper in areas affected by construction activities are detected, as well as around informal waste dumping sites. Additionally, unsustainable practices, such as extracting gravel and crushed stone from rivers and mountains for concrete production, continue to harm local ecosystems.

1.3. Construction and demolition waste

Waste statistics expose the circularity gap. Licensed landfill records show 89,176 tonnes of construction and demolition waste (C&DW) for Ulaanbaatar in 2014 and 65,864 tonnes for January to August 2015, but no national or material-specific data thereafter (Ulaanbaatar City Waste Management Authority, 2015). However, measurement is inconsistent: municipal reporting suggests CDW makes up roughly 10–15% of the city's total waste stream, whereas other assessments cite CDW as much as 40% by mass. Yeartoyear totals fluctuate, largely because demolition activity drives large pulses of waste when buildings are taken down; consequently, annual CDW volumes and their share of the waste stream can diverge substantially depending on the intensity of redevelopment and clearance programmes. (SWITCH-Asia, 2017).

Field studies estimate more than 80% of C&DW is illegally dumped to avoid fees, while pilot programmes have demonstrated recycled concrete aggregate substituting 30-50% of virgin sand and gravel at 20% lower cost (SWITCH-Asia, 2022; Mongolian University of Science and Technology, 2022).

Until recently, Mongolia lacked detailed regulations specifically targeting construction and demolition waste, resulting in widespread informal disposal and limited opportunities for material recovery. The introduction of Regulation No. 49 in February 2020 marked a significant step forward, aiming to improve the management of construction waste and to promote reuse and recycling by categorising waste streams and establishing clearer procedures for collection, segregation, transport, and processing (SWITCH-Asia/Caritas Czech Republic, 2020; Switch to Green, 2020). Despite this progress, the specificity and enforcement of existing regulations, particularly those related to demolition processes, remain inconsistent, with variations in local interpretation and oversight. This regulatory uncertainty can undermine the safe handling of waste and hinder the adoption of circular practices.

While the 2020 regulation sets a target to recycle 20% of construction waste and encourages more sustainable production and consumption, gaps in enforcement persist. These gaps can result in unsafe practices, such as illegal dumping, and reduce the effectiveness of circular economy initiatives. Additionally, limited awareness and capacity among small and medium-sized contractors further complicate the transition towards circularity, highlighting the need for ongoing regulatory refinement, capacity building, and stronger monitoring mechanisms (SWITCH-Asia/Caritas Czech Republic, 2020; Switch to Green, 2020).

One key aspect of integrating circularity considerations into the demolition of already existing structures built under the linear paradigm is the recovery of high-quality components and materials during demolition. For this, dismantling techniques must be promoted that reduce crosscontamination, and keep valuable components intact or at least reusable. Instead of demolition with heavy machinery like bulldozers, this requires the use of tools by demolition workers and requires more working hours over a longer period of time (SWITCH-Asia, 2017). To be economically feasible, legislation needs to be in place which incentivises this type of material recovery; while at the same time, modular building technology, as is being promoted in various projects, has the potential to improve the recovery rate by integrating demolition or dismantling from the design phase onwards.

Details and definitions of Waste Management Practices according to the Regulation No. 49

- **Waste Generation and Reduction:** Construction waste is generated from various sources throughout the building lifecycle, including new construction, renovation, demolition, infrastructure projects, and the construction materials industry and trade. Waste generators are required to work towards reducing waste at the source and must develop and report on a Waste Management Plan.
- **Sorting and Storage:** Construction waste is classified as either “hazardous” or “ordinary”. Waste generators must identify waste at its source and sort it accordingly. The standards provide a coded list of waste types, including those containing hazardous substances like asbestos, mercury, and PCBs. Proper sorting and storage at the construction site are required.
- **Collection and Transportation:** Authorized entities are responsible for the collection and transportation of construction waste. Vehicles used for transportation must meet specific technical requirements and are prohibited from dumping waste in undesignated locations. Topsoil and foundation dirt are directed to specific locations for reuse or land rehabilitation.
- **Recycling and Reuse:** The regulations classify types of construction waste that can be recycled (e.g., paper, plastic, metals, glass, wood, concrete, bricks) and reused (e.g., foundation blocks, beams, bricks, wooden products, soil). These activities are encouraged to bring waste into economic circulation and conserve natural resources. Authorized entities are responsible for recycling and reuse, and recycled materials must undergo quality testing.
- **Disposal:** Waste that cannot be reused or recycled, particularly that containing hazardous substances, is designated for disposal or burial. Non-recyclable, non-hazardous waste is buried at designated central points for general waste. Hazardous construction waste is managed and disposed of according to specific regulations outlined in the Law on Waste.

2. Opportunities for integrating circularity considerations into the building and construction sector

Opportunities for circularity in Mongolia's building and construction sector are substantial, and under-explored. By reframing design, procurement and lifecycle management around reuse, repair and material efficiency, the sector can reduce waste, lower embodied impacts and extend asset lifetimes while generating local jobs and innovation. This chapter identifies pathways to 1) build foundational knowledge about green building characteristics; 2) strengthen skills and financing mechanisms for energy efficiency through refurbishment and retrofitting; 3) further professionalise handling of construction and demolition waste; and 4) unlock innovation—from alternative, locally adapted materials and assembly methods to digital tools that enable material tracking, design optimisation and performance monitoring. Bringing together capacity building, policy incentives, targeted investment and international learning can catalyse practical pilots that demonstrate scalable circular approaches.

2.1 Improving understanding and building capacity for a circular building sector

Across policy, institutional, technical and community levels in Mongolia, the understanding of circularity in the building and construction sector remains partial and uneven, constraining coherent action and scaleup. Materialstock and flow analyses characterise the sector as still at an early stage for circular approaches and highlight substantial data gaps that impede evidencebased planning and lifecycle decisionmaking. While project initiatives and new regulations have advanced awareness and initial capacity on construction and demolition waste, implementation, routinisation and extension of circular practices beyond waste management are incomplete. Practitioners and local authorities frequently lack standardised tools to assess lifecycle impacts, trace secondary materials, or align procurement, design and endoflife incentives. These are obstacles noted in multistakeholder regional programmes for buildings and construction (SWITCH-Asia, 2017).

International guidance often frames circularity as the broader '10R' hierarchy (see above) — 'Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover' — which helps to prioritise highvalue retention strategies over lowvalue disposal. Translating the '10R' into Mongoliaspecific, levelappropriate guidance, datasets and demonstrators is therefore an important priority to move from isolated pilots to systemic, climateresilient circular practice. One step in this direction is the recently launched BestGER evaluation system (Case 1).

Case 1: BestGER Green Building Evaluation System - Green Building Council

The Green Building Council of Mongolia introduced BestGER (Best Governance in Efficiency and Resilience) in 2024, a building evaluation methodology calibrated to national conditions, including strong temperature variability and high seismicity. While comparable in intent to, LEED and EDGE, BestGER aligns performance criteria with Mongolia's climate, infrastructure and risk profile. Two schemes are offered. BestGER Comprehensive applies 39 criteria across six sections to assess energy and heatsupply resilience, envelope/systems performance, materials and resource management, water efficiency, environmental quality and site risks for residential, commercial and industrial projects. BestGER Simple reduces this to 12 criteria in two sections, concentrating on energy efficiency and construction resilience for smaller developments, tailored to new housing in ger areas. Criteria cover thermal performance, electricity use, renewable integration, water conservation and basic recycling. The resilience/environment component considers structural integrity and resistance to seismic events, floods and fires, plus indoor air quality and accessibility—reflecting Mongolia's hazard exposure. The methodology emphasises performancebased, costaware measures (e.g., efficient materials, robust detailing) to lower operational loads and reduce repair needs, while accommodating traditional dwelling forms through contextspecific design requirements. (World Bank (1), 2024; The UB Post, 2024; Green buildings Council of Mongolia, 2024).

To integrate a fact base on material value circularity into current policymaking, a coordinated data programme to standardise materialstock and flow methodologies, define minimum data requirements and maintain a simple shared registry for secondary materials to improve traceability could be useful.

As part of this, institutional capacity could be built through training for municipal officers, planners, architects and contractors; subsequently, a technical working group could be set up to align policy, data and implementation, and integrating circularity into university technical college curricula. In terms of public programmes, project requirements could be developed for public buildings and social housing which combine designforrepair, selective dismantling and local reuse/recycling to produce local evidence and business models for circularity. This could be combined with international (climate) finance programmes, or with national housing programmes (Case 2).

Case 2: Financing for "missing middle" - World Bank

The World Bank's recent report on Mongolia's housing sector defines the "missing middle" in Mongolia as the types of interventions that are catering neither to very low-income households, nor to high-income dwellers (like moder high raise developments). Rather, the report recommends interventions that would integrate important considerations like accessibility, seismic resistance, and sustainability, into construction developments and renovations, yet are affordable and financeable for households and the public sector, and not targeted at the luxury market. The report recommends four key approaches to foster missing middle housing that is resilient and "green": 1) upgrading existing homes, including in ger areas, 2) introducing new housing typologies, including multi-party apartment houses, as well as, with regard to urban planning, 3) increasing density in neighbourhoods that already have infrastructure, and 4) implementing 'sites and services' schemes to guide city expansion. (World Bank (1), 2024). Regarding upgradation, the report finds that ger area households currently face significant obstacles in accessing housing finance for green and resilient upgrades. Most residents have limited incomes and savings, with half dedicating substantial portions of their income to loan repayment. Market incentives for energy-efficient upgrades are scarce, as energy is subsidised; also, there is currently limited access to subsidised green loans and a general low awareness of available programmes. To address these barriers, targeted support for both communities and financial institutions is identified as a solution, including formalisation of ger houses as collateral, down payment assistance, new retrofit loan products, and awareness campaigns. This could also imply a significant change in the setup of the Housing Finance Programme (HFP) setup by the government to currently mainly promote high-rise apartment buildings, by investing into different types of buildings and existing ger housing. Linking finance to BestGER certifications and Mongolia's Green Taxonomy could further promote upgrades, while bundled loans and technical support would make home improvements that strengthen resilience and energy-efficiency more accessible to ger households. (World Bank (1), 2024)

Inclusive stakeholder engagement on integrating circularity considerations into existing programmes, or into the development of new ones, should highlight cobenefits—jobs, air quality and health, energy and cost savings—to secure broad buyin and enable steady scaling from circular pilots to routine practice.

2.2 Skill building and financing for energy efficiency through refurbishment and retrofitting

Refurbishment and retrofitting of existing buildings, rather than demolition, represent a significant and growing area of innovation in Mongolia's construction sector. This approach is particularly important for improving energy efficiency, reducing emissions and pollution through coal fires, and extending the lifespan of buildings and thereby supporting improved circularity in the sector.

Several, partly long-running, international cooperation projects have brought forward the understanding and approaches towards improving energy efficiency, and have also contributed to extending lifespans of existing buildings and infrastructure, one of the keystone interventions for circularity. These projects include pilot schemes that introduce energy-efficient house designs for ger-area redevelopment, and broader strategies to integrate refurbishment into Mongolia's urban sustainability agenda. The focus on refurbishment not only preserves embodied carbon and reduces waste but also supports the social sustainability of neighbourhoods

by minimising displacement and maintaining community cohesion. Of particular note is the need to engage informal work teams, the "brigades" into refurbishment efforts. These typically support the construction of basic dwellings in these ger areas, a key characteristic of the Mongolian construction sector; the upgradation of Ger neighbourhoods requires their upskilling and provides continuous work opportunities.

Informal work teams / "Brigades"

Brigades typically comprise 3–6 core workers with substantial practical experience but minimal formal training. Some teams possess operational licences; however, business is largely driven by referrals and informal networks. These enterprises are critical to Mongolia's construction sector, yet technical staff qualifications, occupational health and safety standards, and financial management practices are seldom prioritised. Their operational model relies on flexibility and labour-intensive skills rather than formal procedures, resulting in gaps in compliance and capacity development within the industry. (GIZ, not dated).

Case 3: Energy efficient refurbishment of ger areas - GIZ

The "Energy Efficient Building Refurbishment in Mongolia" project was implemented by GIZ in partnership with the Municipality of Ulaanbaatar and supported by the Swiss Agency for Development and Cooperation (SDC) and the German Federal Ministry for Economic Cooperation and Development (BMZ). Starting in 2007, with its most recent iteration phase closing in 2022, the project included the thermo-technical upgrading of ger area buildings as well as improvements on public buildings, and capacity building measures regarding prefabricated concrete apartment blocks. The project aimed to educate and prepare implementation regarding the upgrade insulation, window, and heating systems, thereby reducing energy loss, improving indoor comfort, and extending the buildings' lifespan. The project also included public investment management, and contributions to the development of a Local Energy Efficiency Action Plan (LEEAP) for the construction sector (Energypedia, 2024; GIZ, 2022; DEM, 2021).

Case 4: Combining Ger upgradation with financing - SWITCH-Asia

The EU-SWITCH-Asia "Switch Off Air Pollution (SOAP)" project targeted the reduction of air pollution and greenhouse gas emissions in Ulaanbaatar's ger areas by promoting energy-efficient and cleaner heating solutions. The project worked with local SMEs to increase the production and market uptake of advanced insulation materials and energy-efficient housing products, directly addressing the root causes of household air pollution. Through awareness campaigns, technical training, and demonstration activities, SOAP supported local SMEs in adopting cleaner production methods and brought improved insulation materials to more than 1,500 households. A follow-on project is currently being implemented, where the Mongolia Green Finance Corporation (MGFC) and the Mongolian National Construction Association (MNCA) contribute as implementing partners, and the French Agency for Development (AFD) provides co-financing. The project also facilitates policy dialogue and contributed to the development of standards for insulation products, ensuring the sustainability and scalability of results. By focusing on both supply and demand, SOAP is making measurable impact on reducing winter air pollution in informal settlements, highlighting the critical role of SME engagement, consumer awareness, and supportive policy frameworks in tackling Mongolia's urban air quality crisis. (SWITCH-Asia (1), 2020; SWITCH-Asia (not dated)).

For the past decade, development cooperation and project work in the Mongolian housing sector has become markedly more complex: projects engage national ministries, municipal authorities, civil society representation, academia, other development agencies and donors, as well as business associations, private contractors and finance actors, creating multi-level stakeholder networks. The policy and financing landscape has evolved too — national energy efficiency laws and action plans sit alongside donor funded pilots, NAMAs and technical assistance, while concessional loans and bank led pilot financing schemes expand funding channels. This mix of actors, instruments and policy objectives increases coordination needs and heightens

emphasis on capacity building, integrated planning and tailored financing solutions.

Case 5: Energy Performance Contracting/ Retrofitting of prefab apartment buildings - NAMA/ GIZ

The NAMA Support Facility project "Energy Performance Contracting for Residential Retrofitting in Ulaanbaatar City," is implemented by GIZ from 2022-2030. It seeks to create market conditions for large-scale thermo-technical retrofitting. The project's goal is to renovate more than 370 prefabricated concrete residential buildings in the capital by 2027, supported by an energy efficiency fund and regulatory reforms to encourage investment in refurbishment over demolition. Complementary training and awareness initiatives will target key construction firms, homeowners' associations, the Municipality of Ulaanbaatar, the Housing and Public Utilities Authority, and the Ulaanbaatar District Heating Company. The project will also deliver policy guidance and advocacy to advance Mongolia's heat tariff reform agenda. (Mitigation Action Facility, 2024; GIZ, 2022; GIZ 2024).

2.3. Skill building on construction and demolition waste

With a significant number of buildings in Ulaanbaatar nearing the end of their service life and requiring demolition (around 230 buildings), the amount of waste generated can be substantial but also presents opportunities for material recovery based on established waste norms.

Low-capacity landfills in Mongolia's centralised areas often refuse to accept CDW, resulting in widespread illegal dumping in suburban zones. Ulaanbaatar alone collects approximately 1.4 million tonnes of waste annually, with 20–30% originating from construction activities. While the Ministry of Construction and Urban Development has introduced regulations for sorting, reusing, and recycling CDW, the main challenge remains the effective nationwide implementation of these measures (Government of Mongolia, 2020; UB City Governor's Office, 2021).

The current regulatory environment, while improved, still does not fully incentivise or mandate circular approaches throughout the construction lifecycle (Capacity4Dev, 2020). Inadequate enforcement and limited institutional capacity also impede innovation and slow the uptake of advanced materials and sustainable technologies. Furthermore, the sector faces challenges due to limited access to modern testing and certification facilities, which restricts the introduction of new materials and technologies that could enhance sustainability and resource efficiency.

Case 6: SWITCH-Asia "Recycling Building Materials"

The SWITCH-Asia grant project "Recycling Building Materials in Mongolia" addressed the issue of construction and demolition waste (CDW) in Ulaanbaatar by establishing the country's first CDW recycling facility. The project demonstrated how CDW, previously disposed of in landfills or through illegal dumping, could be processed into recycled aggregates for use in new construction materials such as concrete blocks and paving tiles. Over the project's duration, more than 10,000 tonnes of CDW were recycled, and 20 SMEs were engaged and trained in sustainable waste management practices. The project also played a key role in supporting the adoption of new regulations and standards for CDW management, including the introduction of Mongolia's first regulation on construction waste. By raising awareness among construction companies, authorities, and the public, and by facilitating market development for recycled products, the project contributed to reducing environmental pollution, conserving natural resources, and creating economic opportunities in the green construction sector. (SWITCH-Asia (2), 2020).

Currently, there is no laboratory or training center dedicated to waste management, including construction waste. Across the nine districts of Ulaanbaatar, there are only few staff members specializing in waste management, and they have not been involved in recent developments in the sector. Lack of clear regulations and standards for the usage of such recyclates is currently hampering the sales of backfill and similar material. Once resolved, the next step towards circularity can be taken, and output materials turn into secondary raw materials for advanced building components and structures. (Site visit by author/international expert).

With regard to secondary raw materials, straightforward verification protocols and labelling could be developed to build market confidence, while supporting local materialrecovery enterprises. In the longer-term accredited certification pathways for recycled construction materials should be developed, aligning test protocols at national institutes with international norms. This could be propelled forward by accreditation schemes for the most relevant materials in terms of circularity. For these, certification could be coupled with product labelling, and promotion and subsidising of the use in the construction process, to lower entry barriers and ensure safety and trust in secondary materials.

In addition to existing legislation, a phased national framework mandating source separation, reuse quotas and endoflife reporting for major demolition projects, reinforced by fiscal incentives (tax credits, accelerated depreciation) has proven successful in other contexts, including the Netherlands, Germany, and other EU countries. This would require an interministerial oversight unit to monitor compliance and coordinate funding for capacity building and regional infrastructure.

Ulaanbaatar's municipal authorities would need to invest into the establishment of a dedicated CDW management unit to upscale existing pilot initiatives; this would include the streamlining of permitting, the enforcement of sorting requirements, and the development and operation of licensed temporary depots for materials resulting from CDW. In addition, public procurement and publicly funded programmes would need to prioritise the purchase of certified secondary products to stimulate local demand. Regional actors should invest in strategically sited processing facilities—supported by publicprivate partnerships and temporary operating subsidies or guaranteed offtake—to ensure quality control and reduce illegal dumping pressure on landfills. Complementing these measures, targeted accredited training for deconstruction crews, site managers and municipal inspectors, together with community outreach and local reuse grants, would professionalise practice and build public support for circular CDW solutions.

2.4 Improving Innovation Potential for Circularity in Mongolia's Building and Construction Sector

Mongolia's building and construction sector exhibits considerable innovation potential for advancing circularity, particularly through the local integration of both proven and emerging building solutions. The sector's progress depends not only on adopting high-tech advancements but also on scaling up simple, low-tech methods that are well-suited to local conditions, resources, and skills.

Realising circularity across Mongolia's building sector requires targeted innovation at each of six stages of buildings. Zoning should incorporate materialstock planning and flexible land uses to enable deconstruction, onsite reuse and local processing hubs. Planning schemes should mainstream lifecycle assessment, designfordisassembly and aggregation of retrofit opportunities within district regeneration strategies. Materials innovation spans standardising certified secondary materials, promoting lowembodied options suited to Mongolia's climate, and establishing accessible testing and labelling to build market confidence. Construction practice needs techniques for refurbishment (Case 7) which allows for extending the lifespan of existing buildings.

In addition, there are circular opportunities in promoting modular assembly and reducedwaste workflows, supported by accredited training and digital tools for material tracking that would rely on selective dismantling. Maintenance would need to shift from reactive repair to planned, performancebased service regimes that extend asset life and facilitate component recovery.

Case 7: Shunkhlai Plaza - EBRD loan and GEF trust fund

A landmark example of innovative refurbishment in Mongolia is the transformation of the former cashmere-processing factory into the new Shunkhlai Plaza office building. Supported by a loan of MNT 90 billion (approximately €24.6 million) from the European Bank for Reconstruction and Development (EBRD), this project demonstrates how the adaptive reuse of existing structures can drive decarbonisation and set new standards for sustainability in the Mongolian construction sector (EBRD, 2023). The refurbishment converts the factory in central Ulaanbaatar into a modern six-storey office space, including catering and commercial facilities. Shunkhlai Plaza aims to achieve at least a "Silver" rating under the internationally recognised Leadership in Energy and Environmental Design (LEED) certification. This is accomplished by reducing energy consumption by at least 30% and water use by at least 20%, making the building a benchmark for green office developments in the country. The project's high visibility raises awareness of sustainable construction practices among both industry stakeholders and policymakers. The project's financing is further supported by the EBRD's Finance and Technology Transfer Centre for Climate Change (FINTECC), with concessional funding from the Global Environment Facility (GEF) Trust Fund. FINTECC's contribution will enable the installation of advanced air-conditioning systems and LED lighting, underlining the role of technology transfer in Mongolia's green transition.

As one of the first major refurbishments to target international green building standards in Mongolia, it serves as a demonstration project for the feasibility and benefits of refurbishment over demolition. It is likely to encourage further adoption of green certification and refurbishment practices, while also informing the ongoing development of national building codes and incentives for energy efficiency and circularity.

Finally, demolition and reuse require protocols for selective deconstruction, quality sorting, and secondarymaterial value chains linked to local manufacturers and procurement. Blending low-tech, locally appropriate technologies with institutional reforms and finance mechanisms will make these innovations feasible and scalable across Mongolia. In particular, investment in waste management infrastructure (Case 8) must be synchronised with regulatory frameworks and workforce development to realise its full circular potential. Physical facilities alone will not capture value unless permit regimes, quality standards and market rules guarantee steady feedstock, traceability and product acceptance. Equally, operators, plant technicians, site managers and deconstruction crews require accredited training and access to standardised procedures so that incoming material meets processing specifications and output conforms to construction norms. Publicprivate contracting models, offtake agreements with local manufacturers and performancebased subsidies can derisk early operations while encouraging investment in complementary lowtech sorting yards and mobile processing units for dispersed sites. Coordinated planning—linking facility siting to demolition schedules, logistics and procurement policies—will ensure plants serve real demand, reduce illegal dumping and transform CDW from a disposal cost into a reliable input for domestic manufacturing and circular construction practices. (Site visit by author/international expert)

Case 8: Construction and Demolition Waste Recycling Plant - EBRD

In a significant step towards sustainable urban development, Ulaanbaatar inaugurated a new Construction and Demolition Waste (CDW) recycling plant on September 30, 2024. This facility, the first of its kind in Mongolia, is a key component of the "Ulaanbaatar Solid Waste Modernization Project," designed to address the environmental challenges posed by the capital's rapid construction growth. The city generates approximately 1.4 million tons of solid waste annually, with CDW accounting for 20-30% of that total. The project was realized through a major international partnership, financed by a US$ 9.7 million loan from the European Bank for Reconstruction and Development (EBRD) and a €4.9 million grant from the European Union. Located at the Moringiin Davaa landfill site, the plant has the capacity to recycle 170,000 tons of construction waste per year, turning it into valuable materials like gravel and macadam. This initiative is expected to significantly reduce the burden on the city's landfills, decrease CO_2 emissions, and create stable jobs, marking a crucial advancement in Mongolia's waste management and circular economy efforts. (EBRD, 2023; Montsame, 2024; Switch to Green, 2020) Future plans for the plant include generating energy through incineration and producing paving slabs from the resulting ash, with implementation expected from 2026. At the same time, its current test phase demonstrates the aforementioned problems, including availability of skilled labour, collection, and demand side for the output of the plant.

Another area for innovation is the utilisation of power plant ash as a raw material for building products. Fine ash can be synthesised into high-value materials such as zeolite, while coarser ash could be suitable for producing geopolymers. These applications not only divert waste from disposal but also reduce the need for virgin materials. Notably, sidewalk tiles have already been manufactured from power plant ash, demonstrating the feasibility and scalability of such approaches in Mongolia's context (Byambasuren et al., 2023).

Digitalisation is another key enabler of circularity and innovation. plans are underway to develop an integrated national GHG emissions reduction registry system, which will be instrumental in tracking progress towards the Sustainable Development Goals (SDGs) and supporting national climate commitments (UNDP Mongolia, 2022).

3. Policy Landscape

The Ministry of Urban Development, Construction and Housing is the central administrative body responsible for overseeing the nation's building sector. The most important laws governing the sector are the Law on Construction and the Law on Housing, which are currently undergoing amendments. These will also reflect new provisions regarding earthquake and flooding resilience. A key division within the ministry is the Department of Policy Implementation Coordination on Construction and the Construction Materials Industry, which includes the specialized Division of Construction Materials Industry. This department's core function is to shape and execute national policy related to the production and use of building materials. It works to create a safe and healthy living environment by enhancing the effectiveness of the construction materials industry alongside urban development, housing, and public utilities. The department plays a crucial role in developing industry standards, often aligning them with international practices, and promoting the domestic production of materials to reduce reliance on imports. Furthermore, it has been a key advocate for sustainable practices, such as the recycling of construction and demolition waste, by helping to establish the necessary legal frameworks and procedures to support a circular economy in the construction sector. Currently, in addition to the aforementioned amendments to the Law on Construction and the Law on Housing, the Law on Land, and the Law on Urban Development are also underway and being prepared for submission to Parliament. In addition, the Construction Development Center (CDC) of the Ministry provides technical experts and advisors, and coordinates various processes, including preparation for legislation, also with regard to sustainability and circularity.

The government supports affordable housing initiatives targeting low and middle-income households through programmes such as TOSK (State housing corporation) and NOSK (Capital city housing corporation), which provide both rental and ownership options. Homeownership is further facilitated by the Housing Mortgage Program (HMP), overseen by the Ministry of Finance in collaboration with the Bank of Mongolia, and by the Housing Finance Programme (HFP), currently focusing on high-rise apartments often out of financial reach for average households. Additionally, the state allocates undeveloped land to citizens and public housing agencies, working alongside international financial institutions to redevelop ger areas and construct new environmentally sustainable housing.

Climate commitments and their relevance for the building and construction sector

Mongolia's commitments under the Paris Agreement are highly relevant to the building and construction sector, given the sector's significant contribution to national greenhouse gas (GHG) emissions and energy consumption. In its most recent Nationally Determined Contribution (NDC), Mongolia has pledged to reduce total GHG emissions by 22.7% by 2030 compared to the business-as-usual scenario for 2010. With additional international support and advanced mitigation technologies, this target could increase to 27.2%, and potentially up to 44.9% including forestry and other conditional measures (Government of Mongolia, 2020; NDC Partnership, 2024).

The NDC explicitly identifies the construction sector as a priority for mitigation, alongside energy, transport, agriculture, industry, and waste. The sector's relevance is underscored by Mongolia's harsh climate, where heating demands dominate energy use, especially in urban areas such as Ulaanbaatar. Inefficient building stock, widespread use of coal-based heating, and rapid urbanisation have resulted in high emissions and severe air pollution. Addressing these challenges through improved building codes, energy efficiency measures, and the promotion of renewable energy in buildings is essential for achieving Mongolia's climate goals (NDC, 2023; UNEP, 2021).

The NDC and its associated action plans call for a range of building sector measures: strengthening energy efficiency standards, retrofitting existing buildings, establishing robust monitoring and reporting systems, and supporting access to climate finance. These actions are not only vital for mitigation, but also for improving resilience to Mongolia's growing climate risks and supporting sustainable urban development (UNEP, 2021; Government of Mongolia, 2020).

Key measures identified to reduce GHG emissions in Mongolia's building sector include improving energy efficiency, especially in existing buildings, adopting new energy standards, updating building regulations, introducing heat consumption meters, and developing green building standards. Programmes such as the Energy Efficient Building Refurbishment project in Ulaanbaatar have demonstrated the feasibility and benefits of such measures (SWITCH-Asia, 2020). Furthermore, a web-based electronic system for inventorying building sector GHG emissions has been launched, enhancing the ability to track and manage emissions data effectively.

Circularity supporting legislation

The management of construction and demolition waste in Mongolia is governed by a legal and regulatory framework, including the Law on Waste, the Law on Construction, and the regulation of cleaning up, collection, sorting, transportation, recycling, reusing, disposal and burying of the construction and demolition waste (The Minister of Construction and Urban Development Order No. 48 of 2020). The adoption of this law represented significant progress, as it established detailed procedures for the management of construction and demolition waste. The municipal standard UCS 1706A:2022 "CONSTRUCTION WASTE MANAGEMENT" provides detailed guidance on the collection, sorting, recycling, reuse, transportation, and disposal of waste generated throughout the building lifecycle, from new construction to renovation and demolition.

The 2020 regulation on construction waste aims to reduce environmental impact, strengthen the circular economy, and promote the reuse and recycling of materials, introducing mechanisms for accountability and specific norms for the amount of non-reusable waste per square metre for various construction activities. Waste generators are required to develop and report on a Waste Management Plan, work towards waste reduction at source, and classify waste as either "hazardous" or "ordinary," with proper sorting and storage at the construction site. Authorized entities are responsible for the collection and transportation of construction waste, with strict technical requirements for vehicles and prohibitions on illegal dumping.

The regulations encourage the recycling and reuse of materials such as paper, plastic, metals, glass, wood, concrete, and bricks, while reusable items like foundation blocks and beams are brought back into economic circulation to conserve natural resources. Recycled materials must undergo quality testing, and the Construction Development Center[i] is tasked with compiling and submitting waste data to the Integrated Information System of the Construction Sector. Waste that cannot be recycled or reused—especially hazardous waste containing substances like asbestos, mercury, or PCBs—is managed and disposed of according to specific regulations, with non-recyclable, non-hazardous waste being buried at designated sites. By classifying waste types, the regulation has created new opportunities for the reuse and processing of construction materials.

Oversight and compliance are the responsibility of local government and regulatory authorities, as outlined in the Waste Management Law, ensuring that Mongolia's approach to construction waste management supports both environmental protection and the advancement of circular economy principles (Minister of Construction and Urban Development, 2020; Capacity4dev, 2020; SWITCH-Asia, 2021).

In addition, sustainability and circularity have been recognised as efforts requiring multi-stakeholder platforms, and continuous exchange among public and private actors to create shared understanding and momentum. Therefore, in addition to private sector and NGO initiatives, the government seeks to foster exchange in hybrid contexts; it has also shaped government mandates regarding licensing and standardisation, that are implemented by private sector associations.

i The Construction Development Center operates under the guidance of the Ministry of Urban Development, Construction, and Housing and is responsible for developing and implementing standards and norms in the construction and urban development sector.

Actor description 1: The Mongolian Green Building Council (MGBC)

The Mongolian Green Building Council (MGBC) is a non-governmental organization established to spearhead the nation's transition towards sustainable construction. Officially re-established in its current NGO format in 2021 to ensure stable governance and continuous operation, the council's origins trace back to earlier initiatives supported by the Ministry of Construction and Urban Development. The MGBC works to define and promote the concept of green building throughout Mongolia. Its core mission involves raising public awareness, strengthening the capacity of the building sector, and championing the adoption of green technologies and energy efficiency standards.

The council, which counts today over 70 members, including construction firms, material producers, academic institutions, and financial organizations, plays a crucial role in developing the national framework for sustainable construction.

4. Market Trends and Key Actors

Private Sector Actors and Business Commitments

As a resource-rich country, Mongolia's big conglomerates and specialised contractors lead large mininglinked construction, infrastructure, and urban development projects (for example Gobi Infrastructure Partners and Moncon Group). The sector also comprises numerous midsized and local contractors active in residential and commercial build. Smaller actors include independent contractors, unregistered building and demolition crews (see above) and local material traders operating through informal networks and local markets. Together, this mix of formal conglomerates, specialised suppliers and informal microactors shapes supply chains, quality control and the uptake of circular practices in Mongolia.

Mongolia's private sector is increasingly recognising the business case for circularity and sustainability, particularly as international finance and market opportunities grow. Leading companies, such as Shunkhlai Holding, are investing in green building refurbishments aligned with international standards like LEED, with visible projects such as Shunkhlai Plaza (see above) setting new benchmarks for energy and water efficiency (EBRD, 2023). The construction materials industry, supported by SWITCH-Asia and EBRD initiatives (see above), is also adopting recycled aggregates and alternative materials, while SMEs in insulation and building components are being trained in energy-efficient production. However, widespread private sector commitments are still emerging, with most activity concentrated among larger or internationally connected firms (SWITCH-Asia, 2020).

Actor description 2: Mongolian National Construction Association (MNCA)

The Mongolian National Construction Association (MNCA) is a prominent non-governmental organization that serves as a link between private enterprise and government in Mongolia's construction sector. Founded in 2009, the association unites over 160 of the country's leading construction companies, including investors, real estate developers, designers, manufacturers, and suppliers. Its primary mission is to represent and protect the legal interests of its members, ensuring their collective voice influences national construction policy and regulation. A key function of the MNCA is its government-mandated role, in partnership with other professional bodies, to issue construction permits for assembly, design, and lifting facilities nationwide since 2018. The association is also deeply involved in international cooperation and project implementation. It is an active member of the International Federation of Asian and Western Pacific Contractors' Associations (IFAWPCA) and has managed internationally funded projects, such as the EU's "Switch Off Air Pollution" initiative, which focused on improving energy efficiency in Ulaanbaatar's ger areas. Through these activities, the MNCA is committed to modernizing the industry by introducing advanced technologies and international best practices.

Actor description 3: The Mongolian Construction Materials Manufacturers Association (MCMMA)

The Mongolian Construction Materials Manufacturers Association (MCMMA) is a key non-governmental organization established in 2001 and dedicated to advancing the domestic production and business environment for building materials in Mongolia. The association plays a vital role in representing the interests of its member companies and fostering a competitive and technologically advanced industry. A primary objective of the MCMMA is to support the creation of a favourable investment climate for major construction projects by ensuring a diverse and high-quality supply of local materials. The association actively engages in policy dialogue, aiming to strengthen the industry by supporting technical and technological progress and coordinating economic activities among manufacturers.

A significant part of its mandate includes managing the issuance of special licenses for materials manufacturing, providing guidance on compliance, and maintaining a public list of certified companies. The Association seeks to represent the industry, highlighting critical issues such as the scarcity of essential raw materials like sand and its impact on the broader construction sector. Through these efforts, the MCMMA works to reduce Mongolia's reliance on imported construction goods and promote sustainable, high-quality domestic production.

Actor description 4: The Mongolian Builders' Federation (MBF)

The Mongolian Builders' Federation (MBF), also known as the Mongolian Builders' Association, is a foundational non-governmental organization in Mongolia's construction industry (including also material extraction and production). Established in 1990, it stands as one of the country's oldest professional associations in the sector and has grown to include over 1.800 member entities with branches in all 21 provinces (800 in UB, 1.000 across the country). The Federation's core mission is to represent the interests of Mongolian builders by acting as an intermediary between construction companies and state bodies. It provides a wide array of services to its members, including professional training, certification for engineers and technical staff, legal advice through its permanent arbitration court, and opportunities to participate in international exhibitions and business tours. The Federation is actively involved in training and skills development, offering courses in various construction professions and facilitating employment through its labour exchange. It also supports its members in developing project proposals, adopting new technologies, and improving corporate governance, thereby contributing significantly to the overall development and modernization of Mongolia's construction sector.

Actor description 5: Hybrid House LLC

Founded in 2017, the Hybrid House LLC is a construction company which develops energy-efficient and environmentally friendly housing in Mongolia. The company focuses on building "green townhouses" that incorporate sustainable technologies, such as solar heating systems capable of functioning in temperatures as low as -40°C, independent groundwater sources, and advanced wastewater treatment systems that can purify up to 98% of wastewater for reuse. Operating primarily in and around Ulaanbaatar, Hybrid House LLC collaborates with both public and international entities, including the Ulaanbaatar Housing Corporation and the German development agency GIZ. A key aspect of their mission is to provide affordable housing solutions, particularly for residents of ger areas. To achieve this, the company facilitates access to green mortgage loans, making these modern, sustainable homes more accessible to a broader segment of the population. The company is commited to providing self-sufficient housing solutions that reduce utility costs for homeowners. Through projects like a model townhouse in the Denjiin Myanga area, the company seeks to contribute to the urban redevelopment and sustainability goals of the city.

Academia and Institutes

Mongolia's education system supports the building sector primarily through vocational and technical training complemented by tertiary education in engineering and construction. National green building initiatives and projects like Build4Skills are driving modernization toward sustainable construction practices and workforce development. However, challenges remain in aligning TVET training with industry needs, updating teacher competencies, and increasing the supply of qualified workers to meet the growing construction sector demand (GIZ, not dated). Mongolian academic institutions and research groups are in part already engaged in integrating sustainability and circularity considerations into their curricula. Educational programs are evolving to include green building courses, environmental planning, and sustainable finance, reflecting Mongolia's increasing engagement with sustainability in higher education.

Research is also evolving to include sustainability and circularity, whereas currently academic data and analysis is scarce, including on material stock of the built environment, quantifying the potential for

recycling and reuse, and developing locally adapted circular construction solutions. For example, a recent study mapped the flow of non-renewable materials in the construction sector and highlighted the need for integrating circular economy concepts into curricula and research agendas (Mendjargal et al., 2025). Collaborative projects between universities and international partners are also generating new knowledge on sustainable building materials and lifecycle assessment.

Sustainability is increasingly emphasized through environmental engineering programs at institutions like the National University of Mongolia (NUM) and the German-Mongolian Institute for Resources and Technology (GMIT), which focus on modernizing environmental studies and addressing climate change.

There is also some momentum toward sustainable urban development in Mongolia, illustrated by national and international competitions such as the Hunnu City International Urban Planning Competition (Hunnu city mayors office, 2025) which aims to design a smart, green, and resilient city blending Mongolia's cultural heritage with modern sustainable urban planning principles.

Actor description 6: The Mongolian University of Science and Technology

The Mongolian University of Science and Technology (MUST) offers specialized architecture and urban planning programs, including master's degrees in urban planning and architecture at the School of Civil Engineering and Architecture (SCEA). The school's origins trace back to 1959, when specialized courses for construction and industrial engineers were first established at the National University of Mongolia to develop the nation's technical workforce. This initiative evolved, eventually becoming part of the independent university, MUST, and establishing the SCEA as a key faculty.

Today, the School of Civil Engineering and Architecture is a major academic center with approximately 4,000 students and 181 faculty members, offering comprehensive bachelor's, master's, and doctoral programs. Its curriculum is extensive, covering a wide range of disciplines crucial to modern infrastructure development, including architecture, civil engineering, bridge engineering, road engineering, building materials technology, water supply and treatment, and heating and ventilation. With a mission to be a research-led institution, the SCEA aims to contribute directly to Mongolia's development by advancing new technologies and aligning its training with world-class standards. In that role SCEA was also assigned to leading roles in recent EU-funded programs like SWITCH Asia (grants) projects.

Actor description 7: The Urban Planning and Research Institute

The Urban Planning and Research Institute in Ulaanbaatar is a locally owned enterprise that develops urban development documents and master plans, reflecting interdisciplinary collaboration across many fields, including architecture, infrastructure, and environmental management. This institute has received special licenses to provide planning services and actively contributes to city planning projects mainly in the Capital city.

International Development Cooperation

International development actors play an important role in catalysing Mongolia's circular transition. Programmes such as SWITCH-Asia, and development organisations like GIZ, EBRD, and also multilateral efforts and the NAMA Facility have driven regulatory reform, piloted circular business models, and provided technical assistance for energy efficiency retrofits and CDW recycling (see Cases, and SWITCH-Asia, 2020; GIZ, 2022; EBRD, 2023). These interventions have contributed to the development of Mongolia's first CDW regulation, the establishment of recycling infrastructure, and the mainstreaming of green public procurement in government and the private sector.

Civil Society and NGOs

Civil society organisations and NGOs are increasingly active in advocating for sustainable urban development, supporting awareness campaigns, and facilitating community-level pilots for energy efficiency and waste

reduction, especially in Ulaanbaatar's ger areas. Their work often bridges gaps between policy, business, and community needs, ensuring that circularity efforts are inclusive and locally relevant (SWITCH-Asia, 2020).

Actor description 8: The Passive House Institute of Mongolia

The Passive House Institute is a non-governmental organization dedicated to transforming Mongolia's construction sector towards greater energy efficiency and sustainability. Founded in 2021, the institute champions the adoption of the "Passive House" standard, an internationally recognized benchmark for energy-efficient construction that can reduce a building's energy consumption by up to 80% compared to conventional structures. This is particularly relevant for Mongolia, due to its extreme winter temperatures.

The institute focuses on education, research, and advocacy. Its mission involves promoting these highly insulated and airtight building concepts to provide comfortable, healthy, and low-cost living spaces, especially in the ger areas of Ulaanbaatar. By collaborating with international partners and local stakeholders, the Mongolian Passive House Institute plays a significant role in developing a market for energy-efficient buildings and supporting the nation's goals to reduce heat loss and greenhouse gas emissions.

5. Capacities and capabilities for integrating circularity: assessment of key players[ii]

Developers, contractors, and material suppliers play an important role in shaping Mongolia's building and construction sector. Their decisions on project design, material sourcing, and construction methods directly influence resource efficiency during construction and use phases, as well as waste generation, and the potential for reuse and recycling. In Mongolia's rapidly urbanising context, these actors have both the opportunity and responsibility to integrate circular principles—such as minimising raw material use, prioritising durable and recyclable materials, and promoting innovative construction techniques.

Developers

Strengths:

- Developers benefit from government initiatives such as the Housing Mortgage Program (HMP) and land allocations, which facilitate access to financing and land, enabling the delivery of affordable housing units for low and middle-income groups.
- Rapid urbanisation and ger area redevelopment create sustained demand for new housing and commercial developments, offering developers significant business opportunities.
- Some developers are beginning to incorporate energy-efficient designs and green building principles, partly encouraged by government regulations and international partnerships.
- Collaboration with state agencies and international financial institutions provides developers with technical and financial support for large-scale housing projects, improving project viability.

Weaknesses:

- A few large developers dominate the sector, potentially limiting competition and innovation, while smaller developers struggle to scale.
- Despite government mortgage schemes, many developers, especially small and medium-sized ones, face challenges securing long-term financing for projects, restricting growth and innovation.
- Not all developers have expertise in circular construction methods, green technologies, or compliance with evolving building codes, limiting quality and sustainability outcomes.
- Heavy reliance on state land allocations and subsidies may reduce private sector initiative in risk-taking and innovation.
- Developers often lack incentives or knowledge to prioritise material reuse, waste reduction, and lifecycle thinking, constraining circularity uptake in projects.

Contractors

Strengths:

- Vocational and technical training centres offer programs and short-term courses to prepare students and upskill workers in various construction trades.
- Professional associations like the Mongolian Builders Association contribute to professional development through workshops and continuing education programs.
- Formal education institutions, such as the Mongolian University of Science and Technology (MUST) and the National University of Mongolia (NUM), offer relevant degrees in civil engineering, architecture, and urban planning, providing foundational knowledge and practical skills.

ii The following sections are based on information received from various interview partners in preparation and during a country visit, and previous analyses.

- National contractors have emerging competencies in sustainable construction

Weaknesses:

- There is a recognized need for skilled labour in specific areas of the construction sector.
- A large number of construction workers / “brigades” operate without formal supervision.
- Challenges in education and training include keeping curricula updated with the latest technologies, insufficient hands-on practical training, limited funding for vocational programs, difficulties in attracting and retaining experienced faculty, and inconsistent integration of international standards into training programs.

Material Suppliers

Strengths:

- Domestic manufacturers supply about 30% of Mongolia’s primary construction materials, which has increased from previous levels including key materials such as cement, steel, and wood.
- There is growing interest among suppliers in understanding the evolving policy and regulation landscape, and potential ways of using new incentive structures

Weaknesses:

- A major weakness is the still significant dependence on imported construction materials, primarily from China. This leads to increased costs and project delays due to external dependencies; delays at border crossing points, particularly for essential materials, contribute to rising prices.
- A substantial portion of imported materials enter the country without control or inspection, raising concerns about quality and potential risks.
- Access to state-of-the-art facilities for testing and certifying construction materials is limited.
- There is currently no integrated system in place for the ecological assessment of building materials in Mongolia.
- Hazardous materials continue to be found in commonly used building materials.
- While the need for suppliers to improve their sustainability practices is implied, specific strategies or efforts were not formulated yet.

Developers, contractors and material suppliers in Mongolia’s construction sector present a mix of enabling factors and persistent gaps for advancing circularity. Developers benefit from government programmes (HMP), land allocations and strong market demand from rapid urbanisation and gerarea redevelopment, plus growing uptake of energyefficient design aided by state regulations and international partners. However, market concentration among larger firms, limited longterm finance for smaller developers, dependence on state support, weak incentives and limited expertise in circular methods constrain innovation and lifecycle thinking. Contractors show emerging competencies in sustainable construction, yet skills shortages, (including among the brigade workers) and curricula limit quality and uptake of new technologies. Material suppliers have increased domestic provision to about 30% for key inputs, reducing some reliance on imports, but the sector still depends heavily on imports (notably from China), faces quality and inspection gaps, lacks advanced testing and ecological assessment systems, and has unresolved hazardousmaterial risks—all of which hinder a systemic shift to circular construction.

6. Circular Construction and circular buildings: status assessment along the six stages of construction and case analysis

As previous sections showed, circularity principles are being considered, to varying degrees, across the construction lifecycle in Mongolia. Integrating the findings of previous analyses into the framework of the six stages of the building lifecycle demonstrates the potential pathways for integrating circularity in the sector more effectively.

Urban and Rural Planning and Zoning: Urban development frameworks, notably the Ulaanbaatar Master Plan 2040, prioritise compact growth, efficient resource use and adaptive landuse to reduce lifecycle impacts. A core planning objective, framed as "Saving the city", explicitly supports infrastructure and builtform strategies that enable sustainable energy solutions and facilitate later deconstruction, material recovery and local processing.

Planning and Design of Engineered Structures: Regulatory requirements mandate designs that optimise energy and water efficiency, sewerage and communications while permitting renewable energy and maximising natural lighting. Designs must also incorporate hazard resilience and accessibility. The Mongolian Green Building Council's BestGER assessment system further operationalises circular design through criteria that include embodied energy of materials, reuse targets (10–30% reclaimed content from dismantled buildings), preference for renewable raw materials, approved demolition waste plans, nontoxic product selection and material durability to extend service life.

Materials (structural and operational): Although the sector remains highly importdependent, opportunities exist to either integrate circularity requirements for suppliers, or encourage the uptake of secondary raw materials. Constraints include limited national testing and certification capacity, the persistence of hazardous components in some products, and quality issues.

Construction Works, including Logistics: Rapid urbanisation and public investments are expanding construction activity and material demand, increasing potential C&D waste. Effective site management, logistics optimisation and adherence to the construction waste management standard are essential to minimise onsite losses, contamination and transport inefficiencies.

Maintenance and Facility Management: Maintenance is emerging as a critical stage, especially given Mongolia's harsh climate. Regulatory requirements for periodic condition assessments and repairs complement growing interest in planned, performancebased maintenance, energy efficiency retrofits and facilitylevel measures (solar integration, water conservation, onsite waste sorting); including as part of development cooperation projects.

Deconstruction and Demolition: Existing provisions address safe demolition and environmental safeguards, but enforcement varies. There is increasing emphasis on selective dismantling, material sorting and recycling to recover value. The EBRD–EU supported Construction and Demolition Waste Recycling Plant exemplifies needed infrastructure investment for enabling material recovery. While a legal basis for secondary materials exists, it is currently hampered by a lack of technical standards, certification practices, and practical know-how.

Cross-stage synergies are implicitly addressed through the interconnectedness of these stages and the aim of integrating circular principles throughout the entire building lifecycle. For instance, sustainable design choices impact material selection and waste generation during construction, and proper deconstruction practices facilitate material recovery for reuse in new projects. The development of green building standards and waste management regulations are examples of efforts to create a cohesive approach across stages.

Connecting the 10 R model of circularity with the cases

The 10R model—Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover—provides the different options on how to operationalise circularity across Mongolia's built environment, from national zoning to deconstruction. Highestorder actions (Refuse, Rethink, Reduce) are realised early: urban and rural planning that favours adaptive reuse over new build, densification of existing infrastructure (for example, the Missing Middle recommendations), and design approaches such as Design for Disassembly and lean construction that minimise material throughput and energy demand (GER upgrades and energyefficient refurbishments). Midorder strategies (Reuse, Repair, Refurbish) extend service life and retain embodied energy and value—illustrated by Shunklai Plaza's refurbishment and strengthened waste legislation that makes material reuse economically viable. Remaining circular activities (Remanufacture, Repurpose, Recycle, Recover) close material loops through C&D waste management, recycling and energy recovery. This can also be further enabled by digital tools (BIM, digital twins, material passports) and new business models (ProductasaService).

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
Best GER evaluation (Green Building Council)	(✓)	✓	✓							
Construction and demolition waste plant			(✓)	(✓)			(✓)	✓	✓	(✓)
Energy efficient refurbishment (GIZ)		✓	✓	✓	✓	✓				
Ger upgradation: implementation and financing (SWITCH-Asia)	(✓)	✓	✓	✓	✓	✓			✓	
Missing middle interventions (World Bank)	(✓)	✓	✓	✓	✓	✓				
Recycling building materials (SWITCH-Asia)	✓	✓	✓	✓	✓	✓			✓	✓
Retrofitting of prefab apartments (NAMA/GIZ)		✓	✓	✓	✓	✓				
Shunkhlai Plaza (EBRD and business)		✓	✓	✓	✓	✓		✓	✓	

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

- **Refuse:** The Best GER scheme encourages developers to optimise water and energy efficiency from the beginning of planning; the GER upgradation project optimised for light-weight, locally sourceable materials.
- **Rethink:** The Missing middle interventions aim at making the most of existing infrastructure and investment by densification of existing urban areas; the recycling building materials project sought to build awareness regarding the life spans of materials.
- **Reduce:** The energy-efficient refurbishment project used small and big investments into the building insulation, reducing resource consumption. Likewise, the Ger upgradation project used simple interventions to curb heat loss and improve air quality through reduced burning of wood and fossil fuels.
- **Reuse:** Together with corresponding legislation the waste management plant makes reuse of materials more attractive, given that construction waste in future is formally managed, and therefore expensive.
- **Repair and Refurbish:** Shunklai Plaza project seeks to bring forward refurbishment and also uses repair as a key instrument for maintenance.
- **Remanufacture and Repurpose**: By making waste costly, construction and demolition waste management plant indirectly incentivizes repair.
- **Recycle:** Recycling building materials project demonstrated the viability of recycling for various materials.
- **Recover:** Energy value is retained in waste management as part of both the recycling building materials as well as the waste management plant.

Transitioning the sector requires aligned policy and legislation, including incentives and sanctions, capacity building, and phased implementation: small, demonstrable steps (e.g. onsite segregation, pilot projects for waste management) create the evidence base and market signals needed for systemic change towards resilient, resourceefficient construction. While all analysed cases are funded by international donors, national stakeholder participation and leadership has grown considerably in the last decade; this provides a more conducive environment for innovation and incremental steps towards a sector that integrates circularity considerations more strongly.

7. Overall assessment and conclusion

The Mongolian construction sector is in the nascent stages of adopting circular economy practices. The urbanization process is expected to continue, and environmental and health impacts are highly visible. Therefore, there is growing awareness of environmental issues, and the recognition of the need to move towards more sustainable approaches at multiple governance levels. First efforts to enable a transition towards more sustainable, circular practices in the sector are being made: this includes the establishment of a regulatory framework for construction waste management, as well as the investment in recycling infrastructure, like the Construction and Demolition Waste Recycling Plant at the outskirts of Ulaanbaatar. Private sector and civil society actors likewise promote these efforts, for example through the recent development of a green building assessment that is adapted to Mongolia's unique situation, the BestGER assessment system. However, the sector still faces challenges, including inconsistencies in regulatory enforcement, limitations in technical capacity and skilled labour, and the prevalent issue of illegal waste dumping. The heavy reliance on imported materials poses both challenges and opportunities in terms of circularity; if processes for material requirements are put in place for imports. At the same time, the current shift to domestic material production of key materials could be used to create a circular system where producers are also mandated to take responsibility beyond the primary use phase. While there are promising pilot initiatives and policy discussions, the comprehensive integration of circular economy principles across the entire construction lifecycle is still a developing process.

To achieve momentum on the use of secondary raw materials, a national materials database to trace stocks and flows of the sector would be an important first step to assure data availability; this could be combined with the national initiative to improve digitisation of the sector. The reuse and recycling of materials would need to be promote, for example through quotas, or incentivised, for example by favourable taxation. Integrating quality standards and potentially, certification as a monitored and mandated process step would help to professionalise the market. In terms of existing building stock, demolition planning would need to be improved and future material demand forecasted. The sector's workforce would need to be educated on these new approaches; therefore, accreditation programmes and targeted vocational training for workers could become of importance; these would need to be locally adapted to reflect the current education statues. Skill building should include dismantling, material grading and plant operations practices. Lastly, finance instruments, including blended funds and procurement incentives, could be set up to derisk investments in recycling infrastructure and promote demand for secondary materials.

The above interventions could be combined in demonstrator projects (public buildings, social housing, deconstruction pilots). This would create local proof-of concept for secondary raw materials, promote demand and build informed market participants. All these initiatives should be accompanied by joint research and monitoring efforts of universities, institutes, and associations to further support the transition to a circular economy (Mendjargal, 2025).

Local Integration – The Key to Success:

The success of circular innovation in Mongolia depends on the local adaptation and integration of both low-tech and high-tech solutions. Particularly in smaller cities and rural areas, straightforward, reliable strategies—like basic recycling, modular construction, and the use of locally accessible secondary materials—can be quickly implemented and expanded. When adapted to Mongolia's particular climatic and infrastructure challenges, high-tech solutions—like digital monitoring systems and advanced material synthesis—offer significant long-term advantages. To make sure that innovations are both technically feasible and socially acceptable, cooperation between local government, business, and foreign partners is crucial.

To hasten Mongolia's shift to a circular and sustainable construction industry, all parties involved must work together.

Actions toward circularity

Government/national level:

- Give priority to incorporating the concepts of the circular economy into public procurement procedures, national building codes, and urban planning laws. Offer specific incentives (such as tax breaks or subsidies) to promote the use of recycled materials, green building initiatives, and better waste management techniques. Boost the ability to enforce regulations.
- Use Housing Mortgage Program (HMP) and landallocation conditions to require and incentivise circular criteria (design for disassembly, minimum reused-content, lifecycle carbon reporting, material passports). Pair mandates with blendedfinance instruments and longerterm mortgage/loan facilities targeted at SMEs and developers adopting circular practices to remove the financing barrier and reduce market concentration risks.
- Establish national standards and accredited testing facilities for material quality and ecolabelling, and mandate thirdparty inspection at border entry points. Upgrade vocational curricula and continuing professional development (via MUST, NUM, vocational centres and the Mongolian Builders Association) to include DfD, refurbishment, waste segregation, and digital tools (BIM/material passports). Introduce a phased regulatory framework (incentives, monitoring, sanctions) to make linear wasteful practices less profitable.

Other key stakeholders:

- **Financial organizations, such as those that provide development finance:** Develop financial products and services that support sustainable and circular construction projects, such as green mortgages or loans for energy-efficient retrofitting and waste recycling facilities.
- **Industry Leaders:** Adopt circular business models and make investments in staff training and sustainable technologies. Put in place thorough on-site waste management and look into recycling and material reuse options. Encourage the adoption of standards and policies that will help.
- **Academia and Training Institutions:** Update curricula to include circular economy concepts, sustainable design, and green construction techniques. Conduct research relevant to Mongolia's context and develop practical training programs.
- **International Partners:** Continue providing technical expertise, capacity building, and financial support for policy development, pilot projects, and the establishment of necessary infrastructure for circular construction and waste management. Facilitate knowledge transfer and business ties. Support pilot business models that link local manufacturers, recyclers and SMEs (e.g. local remanufacturing hubs for reclaimed elements) with concessional finance and technical assistance. Include training, quality assurance, and market creation mechanisms (long-term offtake/guarantees) to scale circular value chains and reduce import dependence.

By bringing stakeholders together to take action towards circularity, Mongolia's building and construction sector can become more sustainable and resilient, contributing to its economic development, environmental protection, and the well-being of its citizens.

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Country visit by report author and international expert:

June, 23th to 25th, 2025, prepared by Munguchimeg Perenlei, conducted in tandem with Florian Beranek.

- Discussion with pre-identified stakeholders from the public and private sectors aiming for their buy-in, exploring synergies with recent EU program partners, NGOs, sharing of networks, and associations and business alliances.
- Site visit to a large-scale construction demolition waste recycling plant funded by the EU, EBRD, and some bilateral EU donors.

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