

# Presentation to MIK — Achieving Sustainable Housing Finance Framework in Mongolia



March 2026

International Affairs Group  
International Affairs and Research Department  
Japan Housing Finance Agency



## Part II JHF's Research Project in Ulaanbaatar

### 1. Objective of the Research Project

- Defining the project's goals and expected outcomes

### 2. Collaboration with Hokkaido University and key findings

- Joint efforts to analyze housing performance in Ulaanbaatar

### 3. Implication from the findings

- Insights gained from the research and their implication

# 1. Objective of the Research Project

## Approach to establish Thematic Bond issuance platform

- The **International Capital Market Association (ICMA)** does not explicitly use the term “Thematic Bonds” as a formal category, however, the concept aligns closely with the various types of bonds defined under its framework
- Therefore, “**Thematic Bonds**” are **general and collective terms of Green Bonds, Social Bonds, Sustainability Bonds, and other SDGs related bonds**

### Green Bonds

- Green bonds are defined as bonds where the proceeds are exclusively applied to **finance or refinance projects with clear environmental benefits**
- Examples of eligible projects include renewable energy, **energy efficiency, pollution prevention, and sustainable water management**

### Social Bonds

- Social bonds are defined as bonds where the proceeds are exclusively applied to **finance or refinance projects that address social issues or achieve positive social outcomes**, especially for target populations
- Examples include **affordable housing**, access to essential services (e.g., healthcare, education), and socioeconomic advancement

### Sustainability Bonds

- Sustainability bonds are bonds where **the proceeds are used to finance or refinance a combination of both green and social projects**
- These **bonds align with both the Green Bond Principles and Social Bond Principles**

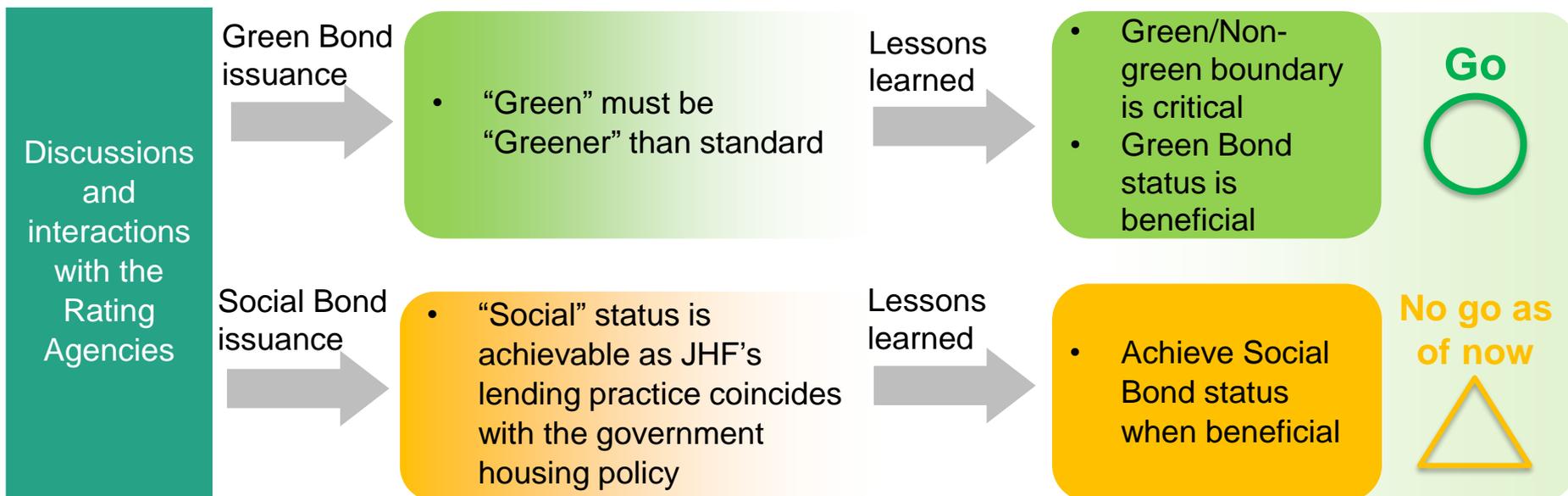
# 1. Objective of the Research Project

## Approach to establish Thematic Bond issuance platform

- Japan Housing Finance Agency (JHF) has been issuing **Green Bond, Government Guaranteed Green bond, and Green MBS since January 2019** and the total issuance volume has reached **1.44 trillion JPY (33.12 trillion MNT)**, as of March 31, 2026
- JHF has discussed establishment of Green Bond Framework in discussions with prominent Rating Agencies, such as **S&P Global Ratings Japan Inc. and Rating and Investment Information, Inc.**

Exchange rate applied: 1 JPY=23 MNT

### JHF's fact findings



# 1. Objective of the Research Project

## JHF's approach to justify Green Housing Loans

- JHF requires **all housing loan applicants to obtain a Certificate of Conformity**, which is issued by a Designated Inspection and Confirmation Institute or a Registered Housing Performance Evaluation Institute.
- Designated institutions must be **registered with either the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) or the office located Prefectural Government**
- The **Certificate of Conformity** verifies that the property meets the technical standards set by JHF, including **earthquake resistance, energy efficiency, maintenance flexibility, and other criteria**



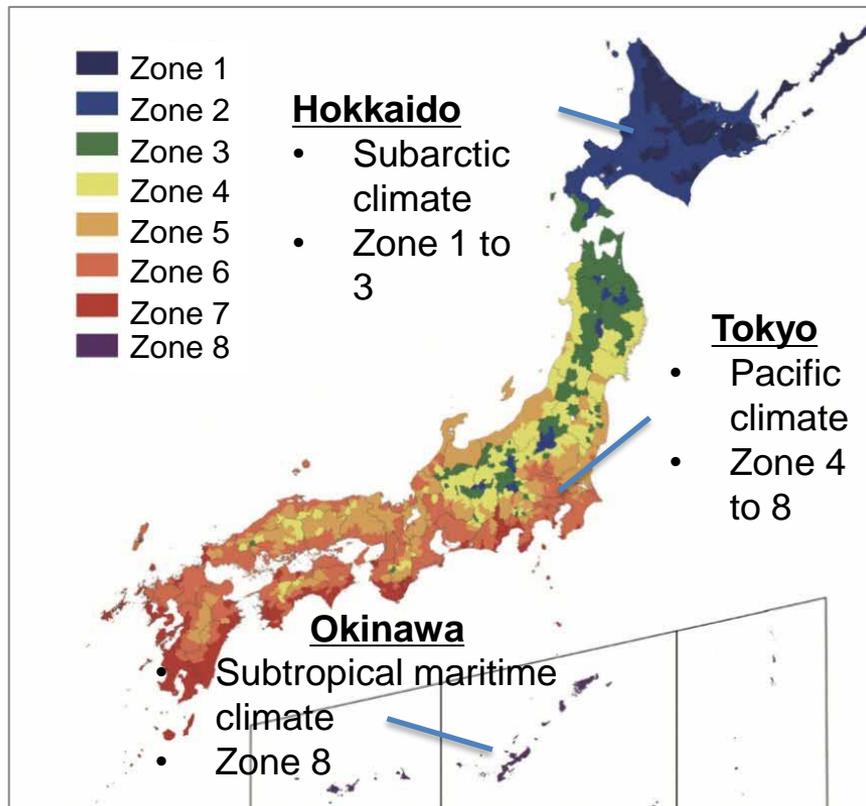
### Research objective

- Understand climate conditions and building materials used in Ulaanbaatar
- Understand BESTGER and its application to achieve future de-carbonization
- Compare BESTGER with Japan's energy efficiency standard to ensure alignment with international standards

## 2. Collaboration with Hokkaido University and key findings

### Hokkaido is a prefecture in a subarctic climate zone

- Sapporo City, the regional capital of Hokkaido and one of the coldest cities in Japan, is home to Hokkaido University, a national institution renowned for its research on housing in extreme cold weather conditions
- Japan Housing Finance Agency commissioned Dr. Taro Mori, a professor at Hokkaido University, to conduct thorough research on the climate conditions and building materials used in Ulaanbaatar, as well as the potential application of Japan's green housing standards in the Mongolian context



### Professor Dr. Taro Mori



- Specializes in architecture, housing, and urban planning, particularly in cold climate regions
- Widely recognized for his expertise in sustainable housing and building technologies designed to withstand extreme weather conditions
- Holds extensive experience working in Mongolia collaborating with Mongolian researchers and institutions
- Holds doctor degree in Architectural Engineering from Hokkaido University

## 2. Collaboration with Hokkaido University and key findings

### Building Environmental Standards for Green Evaluation and Rating (BESTGER)

- BESTGER is Mongolia's first comprehensive green building rating system, optimized for the country's harsh weather conditions and social circumstances
- The ratings indicate how well the building is constructed applying best design, technology, and materials

Assessment Categories	Brief description	Scores applied	
1. Environment	Proximity to public transportation, on-site greening, and waste management	10	Total 100
2. Energy Efficiency	Thermal energy savings, renewable energy use, LED lighting, and sensor-based automation	35	
3. Materials and Resources	Use of recycled materials, low embodied energy materials	10	
4. Water Conservation	Use of recycled water, rainwater harvesting, and installment of smart meters	18	
5. Resilience	Physical robustness and extended lifespan of buildings, including earthquake resistance	15	
6. Indoor Environment	CO2 concentration management, natural light, ventilation efficiency, barrier-free design	12	

- BESTGER scoring based on Assessment Categories provides four tier ratings: **“Certified (40 points or more)”**, **“Silver (50 points or more)”**, **“Gold (60 points or more)”**, and **“Platinum (80 points or more)”**

## 2. Collaboration with Hokkaido University and key findings

### Energy Demand Classification is the core component of BESTGER system

- The **Energy Demand Classification is a core criterion in the BESTGER system**. It evaluates how much energy a building is expected to consume for heating, cooling, lighting, and other operational needs
- The classification is based on calculations or simulations of the building's annual energy demand, typically expressed in kWh/m<sup>2</sup>/year
- **BESTGER metrics requires the building to meet the minimum energy performance threshold, which is 10% or greater reduction of Annual Heating Demand Reduction Rate from Standard. Failing to meet this threshold can disqualify a building from being certified, regardless of performance in other categories**

### ■ Calculation examples applying Energy Demand Classification to model apartment complex in UB

No	Item	Sheet Change Item (Parameter)	Annual Heating Demand (kWh/m <sup>2</sup> /year) Reduction Rate from Standard
0	Base Case: construction using current materials and designs		32 81%
1	Degraded Insulation Quality	U value base sheet $\lambda$ : 0.044 → 0.055	34 85%
2	Introduction of Heat Recovery Ventilation	HL 01 sheet, Ventilation $\eta$ : 0 → 0.5 (50%)	26 65%
3	Reduced Window Insulation Performance	U value base sheet Window U: 1.235 → 2.0	37 92%
4	Loss of solar gain	HL 02 sheet Solar radiation $g_l = 0.6 \rightarrow 0.0$	40 100%

Highest reduction rate

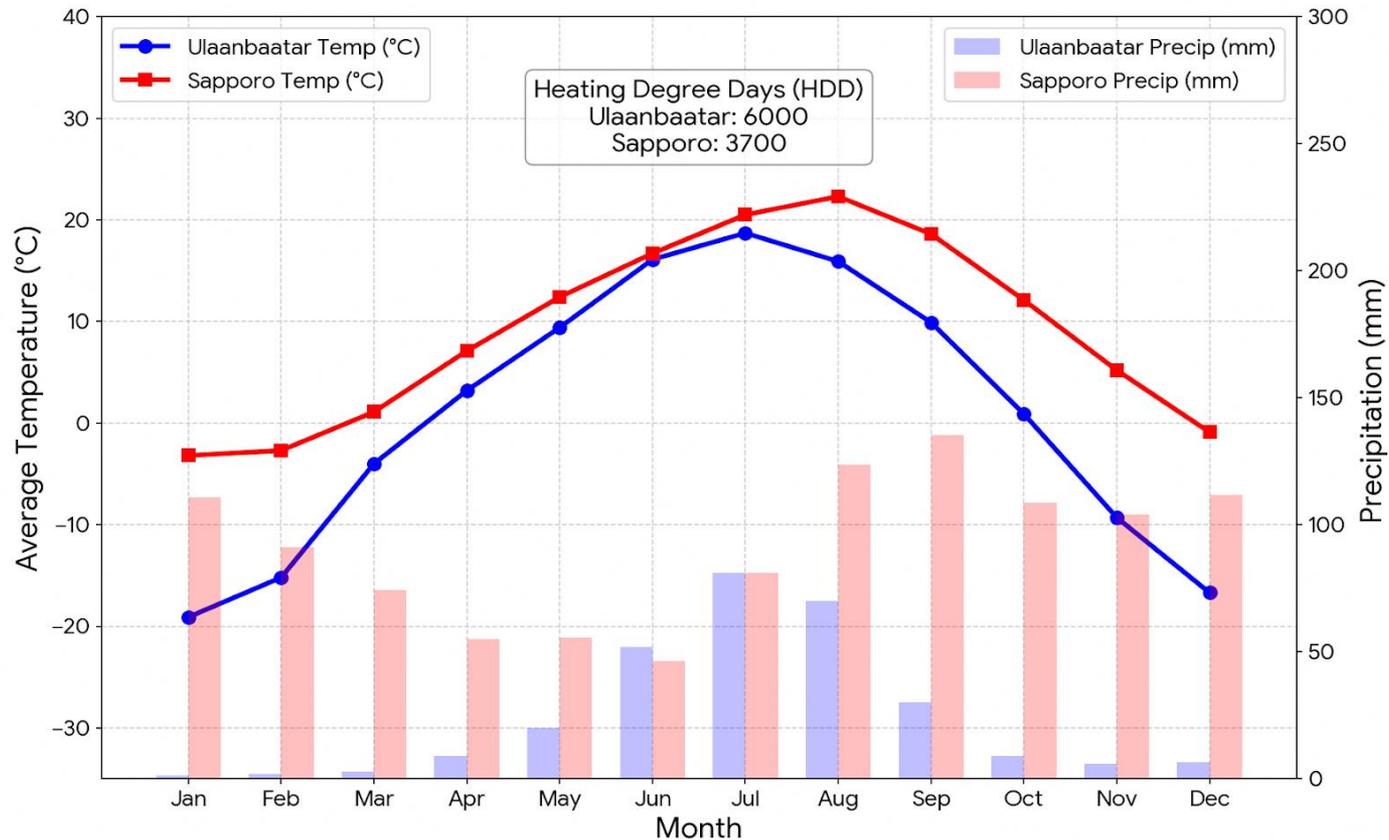
## 2. Collaboration with Hokkaido University and key findings

### Comparison between Japan and Mongolia

- Ulaanbaatar exceeds Heating Degree Days (HDD) of 6000; winter temperatures can fall below  $-30$  Celsius where as Sapporo, the prefectural capital of Hokkaido, has HDD of 3700

Heating Degree Days (HDD) are a measure of how much and how long the outside temperature falls below a base temperature of 18 degrees Celsius.

Climate Comparison: Ulaanbaatar vs Sapporo



## 2. Collaboration with Hokkaido University and key findings

### Comparison between Japan and Mongolia

- In Japan, net Zero Energy House Mansion (ZEH-M) is the standard applied to condominiums or apartment complexes those achieving net zero annual primary energy consumption by having high insulation, energy-efficient equipment, and renewable energy generation features
- Applying ZEH-M features to BESTGER Energy Demand Classification metrics, ZEH-M achieved Annual Heating Demand Reduction Rate of “20” where the BASE CASE scored “22”
- The score discrepancy from the BASE CASE score of “40” for the UB apartment complex indicates that the **UB apartment complex can still be labeled as a Green Building under Japan’s energy conservation standards**. This demonstrates that **BESTGER is a superior framework for measuring the energy efficiency of buildings**

### ZEH-M features applied to BESTGER Energy Demand Classification

Sheet	Item/Cell Position	Input Value	Remarks
U value base	Wall #1: d, m Thickness	0.08	80mm
U value base	Wall #1: l, W/mK conductivity	0.020 ~ 0.022	high-performance insulation such as phenolic foam
U value base	Window: U, W/m <sup>2</sup> K U-value	1.5	Plastic sash + argon double glazing or double sash
HL 01	Row 3, Thermal bridge loss (improved)	1	1, reduce heat bridge correction to 5%
HL 01	Row 3, Thermal bridge loss (common)	0	0, cancel 10% correction
HL 01	Heat recovery efficiency	0.50 ~ 0.80	Enter heat exchange ventilation efficiency (50% - 80%)
HL 01	Ventilation rate (n)	0.5	Enter standard ventilation frequency based on ZEH standards

## 2. Collaboration with Hokkaido University and key findings

### Field trip conducted by Dr. Taro Mori in the outskirts of Ulaanbaatar

- Ger districts, which house a significant portion of Ulaanbaatar's population, lack access to centralized heating systems and residents rely on individual coal-burning stoves to heat their homes during the long and extremely cold winters
- Mongolian coking coal is exported to China whereas **thermal coal is consumed domestically for heating and electricity generation**
- **Ulaanbaatar suffers from severe air pollution during the winter months due to the widespread use of coal for heating; lowering the heating demand of housing is one feasible way to tackle air pollution and health issues**

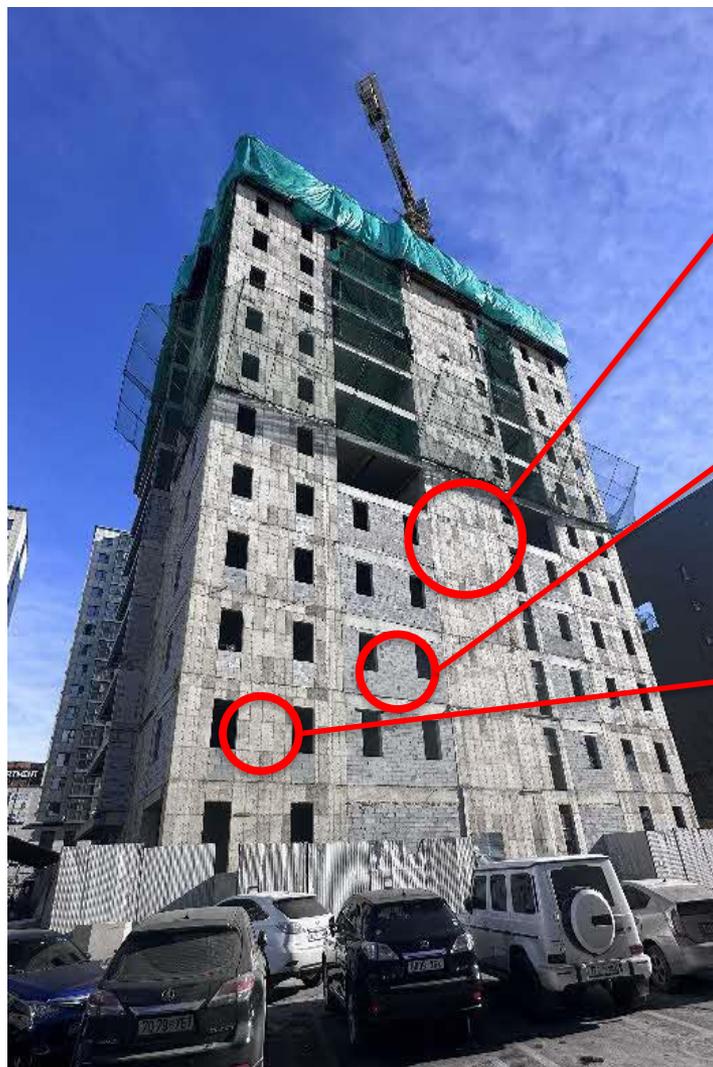


Photo taken by Dr. Taro Mori at a location outside of Ulaanbaatar.

Smog hinders the view towards the city.

## 2. Collaboration with Hokkaido University and key findings

Construction site conducted by Dr. Taro Mori monitoring in Ulaanbaatar



No frame anchors.

Concrete blocks have gaps leading to potential air leakage.

Parts remain, with rock wool inserted.

Photo taken by Dr. Taro Mori at a constructions site in Ulaanbaatar.

## 2. Collaboration with Hokkaido University and key findings

### Construction site monitoring conducted by Dr. Taro Mori in Ulaanbaatar

Wind barrier is installed outside the surface but anchoring of exterior cladding using metal components creates thermal bridges.



Window is designed for a Reveal Width (RW) of 100 cm having an allowance of plus 50 mm, indicating that the window significantly contribute to heat loss.

No external insulation. Windows are installed directly into RC.

No insulation reinforcement at balconies.

Photo taken by Dr. Taro Mori at a constructions site in Ulaanbaatar.

## 2. Collaboration with Hokkaido University and key findings

### A site monitoring conducted by Dr. Taro Mori in Ulaanbaatar



Expanded polystyrene foam finished but using mesh; quality of work itself can be defined as low.



Extruded Polystyrene, a rigid foam insulation material, with insulation gaps were observed in many parts of the structure.



Possible ventilation layer or gap behind cladding.

Photos taken by Dr. Taro Mori at a site in Ulaanbaatar.

### 3. Implication of the findings

#### ■ Application of BESTGER framework to Green Housing Metrics

BESTGER Assessment Categories	Score	Label	Green / Non-green
	80 or more	Platinum	Green
	60 or higher	Gold	Green
	50 or higher	Silver	Green
	40 or higher	Certified	Non-green
	Below 39	Uncertified	Non-green

#### Implication

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- Setting the “Certified (40 points or higher)” as the base case, buildings receiving “Silver (50 points or more)” or higher label should be recognized as Green
- Mongolia’s unique BESTGER evaluation scales align with international standards, such as net Zero Energy House standard applicable in Japan, therefore, BESTGER framework is eligible to define the Green Housing Metrics in Mongolia

### 3. Implication of the findings

#### ■ Application of BESTGER framework to Green Housing Metrics

BESTGER Energy Demand Classification	Case	Annual Heating Demand Reduction Rate from Standard	Green / Non-green
	Minimum	10%	Green
	Unqualified	Less than 10%	Non-green

#### Implication 2

- 10% or higher Annual Heating Demand Reduction shall be the goal set to categorize the building as Green
- Any reduction made to achieve less than 10% will not be recognized as Green, thus, recognized as Non-green

#### ■ Building quality issues became evident during the research

#### Implication 3

- The chronic gap between design intent and on-site construction quality can be addressed through the following approaches:
  - Avoid using mixed standards products and retain skilled on-site workers
  - Ensure quality and precision, especially in “invisible areas”



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