

札幌市・ウランバートル市の
都市間連携事業による学術協力

Academic cooperation through intercity
collaboration between Sapporo and Ulaanbaatar

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Decarbonization urban planning support project for energy transition in Ulaanbaatar City ウランバートル市のエネルギー転換における脱炭素都市形成支援事業

- Decarbonization urban planning support project for energy transition in Ulaanbaatar City
- JCM (Joint Crediting Mechanism)
- Joint research on energy saving and renewable energy in residential life between Hokkaido University and National University of Mongolia

ウランバートル市のエネルギー転換における脱炭素都市形成支援事業



事業概要

ウランバートル市は一次エネルギー消費に占める石炭のシェアが約7割を占める。本事業では、2050年までに二酸化炭素排出実質ゼロを宣言する札幌市によるエネルギー転換の経験や脱炭素都市形成の取組みを活かして、同じ寒冷地であるウランバートル市に対し、適切なエネルギー転換促進をするための取組みを実施する。本事業1年次では、次世代エネルギーの可能性を調査するとともに、制度構築・制度策定支援にかかると取組みを実施する。本事業を通じて、ウランバートル市の2030年までのGHG削減目標への貢献を目指す。

調査項目

寒冷地におけるエネルギー転換促進

- (1) 大型太陽光発電プロジェクトのJCM事業化の促進調査
- (2) JCM事業化の実現可能性調査
 - 1) 水素事業計画に係るJCM事業化調査
 - 2) 地中熱ヒートポンプの検証データ確認、及び、JCM事業化調査
 - 3) 道路交通のスマート化による交通管理の最適化にかかる調査(交通分野)
 - 4) 寒冷地向け空調(住宅向けヒートポンプ空調)のJCM事業化調査
- (3) 制度構築・計画策定支援分野
 - 1) 石炭代替のエネルギー転換促進、地産地消のエネルギーの有効活用に係る施策や知見の共有による、モンゴル国における石炭代替施策・制度への反映の検討
 - 2) 交通分野における脱炭素の取組
 - 3) 環境インフラ導入に向けた民間セクターとの連携促進に係る施策等の共有

事業効果

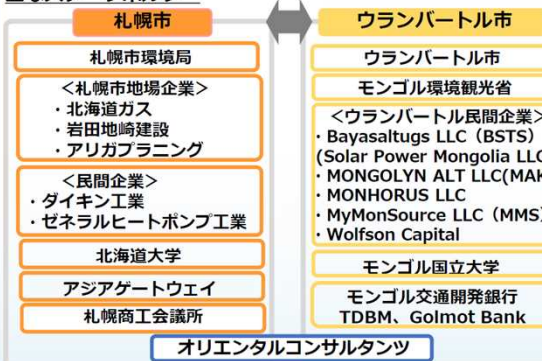
1. 炭素の取組とともに大気汚染対策にかかる支援により、マルチベネフィットに資する取組みが実現される
2. 石炭代替のエネルギー展開が具体化することで、ウランバートル市での「脱炭素ドミノ」による都市形成の実現に貢献する

これまでの都市間連携の現状

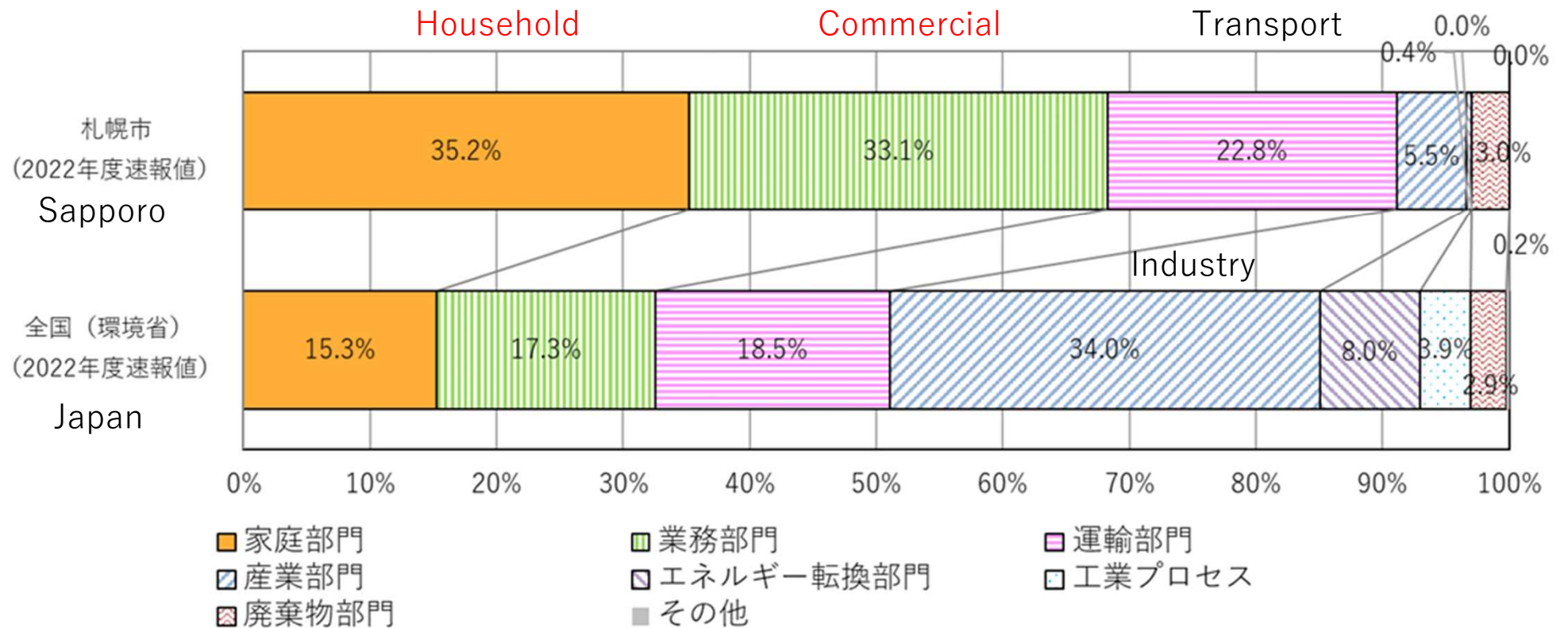
- 札幌市とウランバートル市は、札幌市が主催し世界の9ヶ国22都市が会員となっている国際ネットワーク「冬の都市市長会」メンバー
- 平成24年(2012年)の市長会議で、エネルギーと熱の効率的な利用を謳う「ウランバートル宣言」を採択
- 令和2-5年度「ウランバートル市における脱炭素都市形成支援事業」
- 令和5年 ウランバートル市・企業の札幌ビジネスツアー (JICA支援)
- 令和5年「環境広場ほっかいどう2023」モンゴル企業・ウランバートル市とのセミナー (JICA主催)



主なステークホルダー

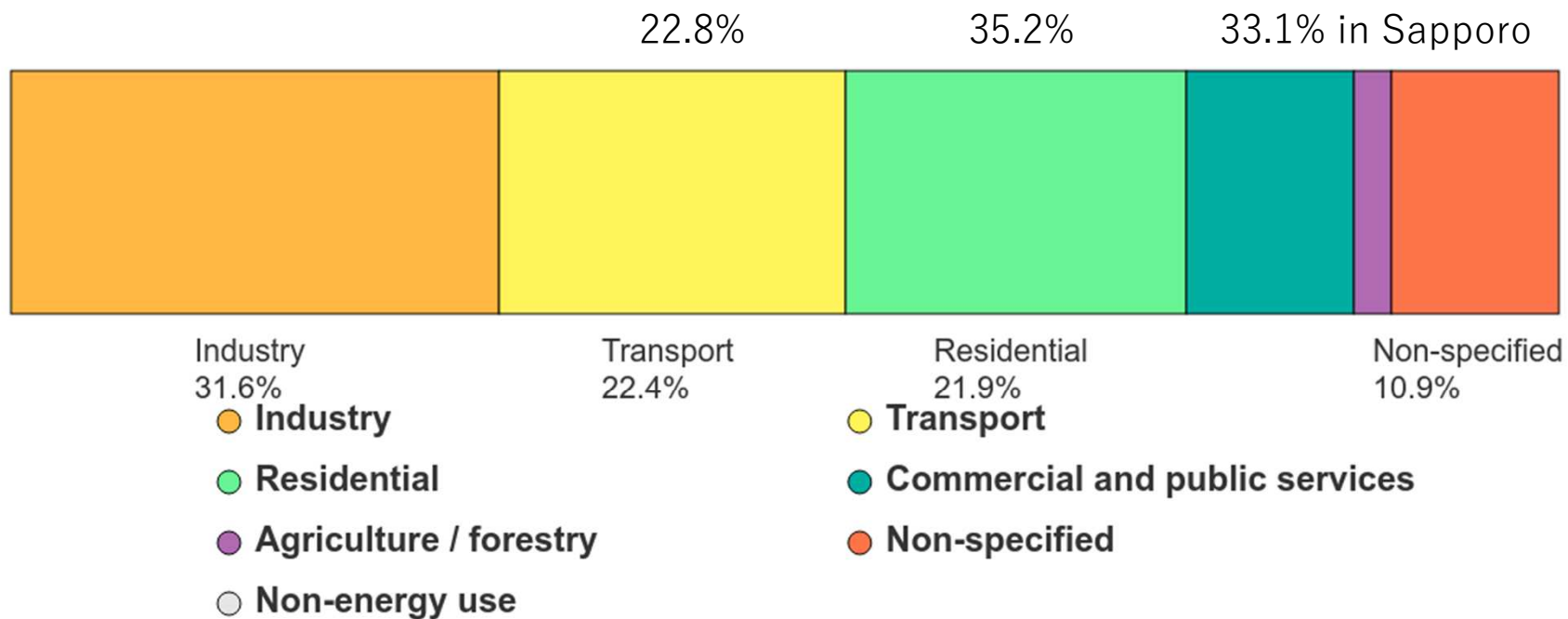


CO₂ emission in Sapporo



Household and Commercial sectors emit CO₂
 引用：札幌市気候変動対策行動計画 進行管理計画書2022

CO₂ emission in Mongolia



Source: International Energy Agency. Licence: CC BY 4.0

Industry and transport in Mongolia emit more energy than that in Sapporo
CO₂ emissions in the residential sector are at the same rate as in Sapporo

Building Energy Efficiency

- Ulaanbaatar and Sapporo have many Common points.
- Cold winter and hot summer.
- **Residential and commercial buildings** emit GHG.
- Energy Efficiency with Building insulation and air tightness is important
- Sapporo: Newly built single-family homes have sufficient energy efficiency performance. However, apartment buildings need more performance.
- Ulaanbaatar: Apartment buildings have sufficient energy efficiency performance (problems with heat supply, heating, and ventilation systems?). Detached houses in ger areas have a big problem.
- PV is effective in Sapporo and Ulaanbaatar with mid-latitudes.

Sapporo eco-e house (札幌版次世代住宅)

Grade	U_A (overall thermal transmittance) [W/(m ² · K)]	BEI (primary energy consumption)	Air tightness
Platinum 2.2 M jpy	Below 0.18	Below 60% of standard	New building Below 0.5 cm ² /m ² Renovation Below 1.0 cm ² /m ²
Gold 1.8 M jpy	Below 0.20 Grade 7 of national energy standard	Below 80%	
Silver 0.6 M jpy	Below 0.28 Grade 6 of national energy standard		
Bronze	Below 0.40 Grade 5 of national energy standard		

PV system: over 1.5kW and Battery: over 2.0 kWh are needed to be resister as Sapporo eco-e house. Sapporo City provides subsidies for Sapporo Eco-E House

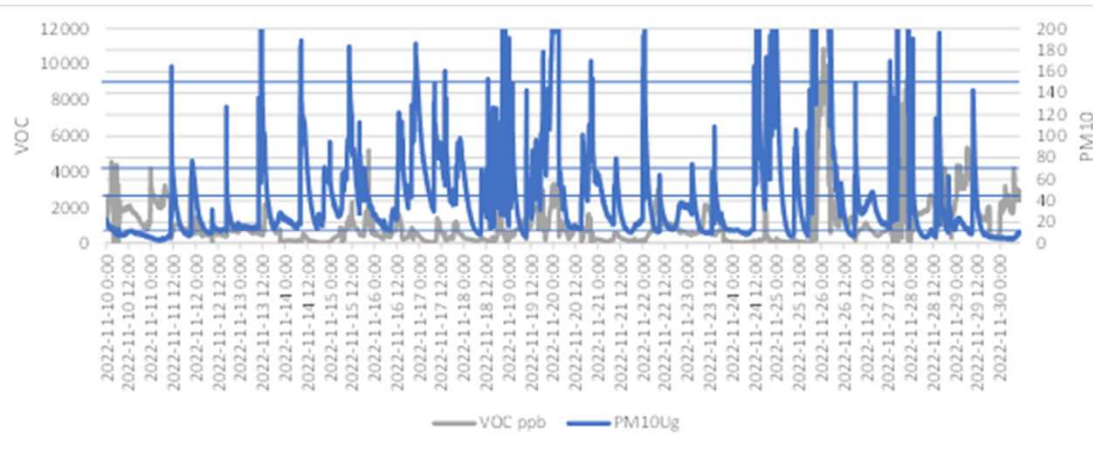
Passive Houses in Mongolia

- In 2020, a 2-story 70m² apartment located in Gandan was registered as an energy-efficient apartment (LEH) for the first time in Mongolia
- The results of measurements, tests, monitoring, and analysis of the NUM-RE laboratory are recorded as evidence

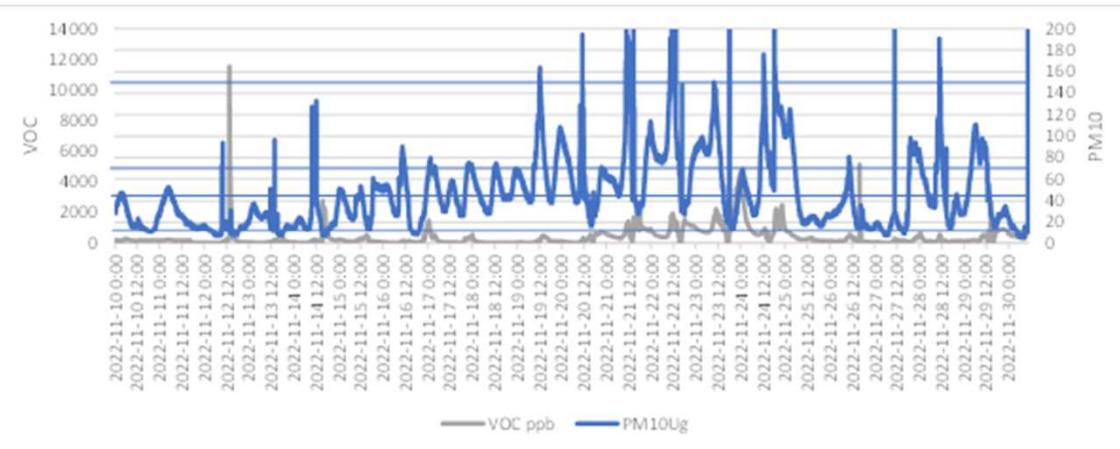


Joint research project with NUM

- VOC and PM measurements in Ulaanbaatar
- Indoor PM was frequently higher than the UN health standard
- An air purifier should be installed.



Apartment



Office

Insulation retrofit project (wooden apartment)

- Sapporo has many wooden apartment buildings built in the 1980s.
- Difficult to renew due to rising construction costs
- Provided as a new apartment after insulation renovation
- Consideration of the energy system
- PV installation in combination with other facilities



Insulation retrofit project (grocery store)

- Grocery stores such as CS consume huge amounts of electricity. 30% of sales are spent on electricity bills caused by AC and Refrigeration
- We found heat loss caused by poor insulation and excessive ventilation with thermal inspection
- Insulation retrofit and reconsideration of the ventilation plan can decrease energy consumption.
- More consideration about refrigeration would be needed.



	insulation	Window	window area [%]	ventilation [m ³ /h]	yearly hvac energy [kWh/yr]	cost
Current	FP 25mm	single 5mm	43.3	1500	41685	¥970,844
case 1	UF 50mm	single 5mm	43.3	150	23940	¥557,563
case 2	UF 50mm	double Ar 12mm	32.06	150	18165	¥423,063
case 3	UF 50mm	double Ar 12mm	24.55	150	16485	¥383,936

Future collaboration

- The Department of Green Energy and Engineering was established at the Faculty of Engineering of the National University of Mongolia in September 2024.
- Pursuing only energy conservation may neglect the indoor environment.
- Plans to conduct joint research on achieving both energy conservation and indoor environment through buildings