ASIA CLEAN ENERGY FORUM 2023

ADB’s Current Clean Heating Works in Mongolia

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MONGOLIA AS ONE OF THE COLDEST COUNTRIES

Ulaanbaatar in January:
Average high: -15.6°C
Average low: -25.9°C

Household energy consumption share
- Heat 70%
- Electricity 30%

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Average Yearly Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Canada</td>
<td>-5.35</td>
</tr>
<tr>
<td>2</td>
<td>Russia</td>
<td>-5.1</td>
</tr>
<tr>
<td>3</td>
<td>Mongolia</td>
<td>-0.7</td>
</tr>
<tr>
<td>4</td>
<td>Norway</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>Kyrgyzstan</td>
<td>1.55</td>
</tr>
<tr>
<td>6</td>
<td>Finland</td>
<td>1.7</td>
</tr>
</tbody>
</table>
HEATING IN URBAN SETTLEMENTS

Typical district heating only boiler and network map

Typical heat only boiler from the outside and inside
ADB’S CLEAN HEATING WORKS (1)

MONGOLIA
ADB CLEAN HEATING PROJECTS
Project Location

Legend
- Upscaling Renewable Energy Sector Project
- Renewable Heating Demonstration in Remote Areas
- Supporting Renewable Energy Development
- National Capital
- Provincial Capital
- Provincial Boundary
- International Boundary

This map was produced by the cartography unit of the Asian Development Bank. The location, titles, and boundaries, to the extent that they are not the property of the Asian Development Bank, are shown as the legal areas of the territories or are other restrictions in accordance with all limitations, rules, and restrictions in determining.
ADB’S CLEAN HEATING WORKS (2)

✓ Scales of focus
(i) Individual buildings
(ii) Cluster of buildings / District heating

✓ Technologies used and planned
(i) Shallow ground source heat pump (Open and closed loop)
(ii) Solar thermal collectors (for heating, hot water, ground injection for GSHP)
(iii) Energy efficiency (Improved insulation)
(iv) Air to water source heat pump
(v) Medium depth ground source heat pump

✓ Other efforts by ADB energy projects
(i) Capacity development for various stakeholders
(ii) Awareness raising campaign for general public
ADB’S CLEAN HEATING WORKS (3)

Current projects

1. Grant: Upscaling Renewable Energy Sector Project
   Effectivity: 12 Feb 2019
   Five Subprojects: Shallow Ground Source Heat Pump systems for heating of Hospital, Kindergartens and Schools.

2. Grant: Renewable Heating Demonstration in Remote Areas
   Effectivity: 06 Mar 2023
   Three soum hospitals will have energy efficiency retrofit and air source heat pump.

3. TRTA: Supporting Renewable Energy Development Project
   Target board approval Q1 2024
   Subproject: Medium depth ground source heat pump for district heating
ADB’S CLEAN HEATING WORKS (4)
Upscaling Renewable Energy Sector Project (Effectivity: 12 Feb 2019)

The system was easily reverted to the heat only boiler for the first operation year temporary due to the reasons:
- Subsidy for heat only boiler was available for use
- Budget for increased electricity use was absent
- Lack of on-site O&M capacity
- Low energy efficiency of the building

MOU was signed between Ministry of Energy and the relative province to increase commitment.
Rationale: Demonstrate **scalable cleaner** heating technology in remote areas Scope:

- Providing clean heating for hospitals which are of high value for less-wealthy and remote communities *(Air Source Heat Pump)*
- Demonstrating energy efficiency first principle
- Demonstrating the benefits, feasibility and scalability of heat pumps, solar energy and electric heating
- Financing: $2 million from **JFPR** (Japan Fund for Prosperous and Resilient Asia and the Pacific)
  - Out of which USD 250k will be spent for **CSOs** to conduct the work prescribed.
Subproject: Medium depth ground source heat pump for District Heating in Kharkhorin

![Operating principle of medium depth geothermal heat pump system](image)

### Table: Comparison of Medium Depth GSHP and Shallow GSHP Systems

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Medium-Depth GSHP</th>
<th>Shallow GSHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well depth</td>
<td>2,000 m</td>
<td>240 m</td>
</tr>
<tr>
<td>Number of wells</td>
<td>4</td>
<td>440</td>
</tr>
<tr>
<td>Total units (meters) drilled</td>
<td>8,000 m</td>
<td>105,600 m</td>
</tr>
<tr>
<td>Drilling costs ($/m)</td>
<td>100 – 500</td>
<td>40-60</td>
</tr>
<tr>
<td>Estimated cost in Mongolia ($/m)</td>
<td>450</td>
<td>59</td>
</tr>
<tr>
<td>Drilling cost ($)</td>
<td>3.6 million</td>
<td>6.2 million</td>
</tr>
</tbody>
</table>

**NOTE:** The proposed project will supply heat to a standard soum district heating network in the megawatt range (2.6 MW, 31 buildings, and 118,600 m³).
Thank you.
EXAMPLE OF LESSONS LEARNED AS OF NOW

MOU was signed between The Ministry of Energy and the relative province specifying:

- Capacity development activities for wide groups
- Ownership of the system by the local government
- Local government to bear O&M expenses
- The operating entity shall be responsible for the integrity/functionality and efficient operation of the assets procured using grant funds