Executive Summary

Mongolia achieved high and stable economic growth from 2008–2018. Energy consumption, especially of conventional energy – such as coal, oil, and electricity – increased significantly as a result. The Government of Mongolia recognises the importance of an energy efficiency and conservation (EEC) policy for the future. As it does not have benchmarks for the current energy efficiency level in the country, the Mongolian Energy Economics Institute (MEEI), a member of the Energy Research Institute Network (ERIN) of the East Asia Summit, requested the support of the Economic Research Institute for ASEAN and East Asia (ERIA) to produce energy efficiency indicators (EEIs). These are to serve as benchmarks in Mongolia's final energy consumption sectors comprising industry (production of industrial products), transport (transport of passengers or freight from point A to point B), commercial buildings and the residential sector.

Phase 1 involved ERIA inviting several MEEI staff members to the ERIA office for capacity building training on basic EEI concepts in June 2018. Lecturers were experts from ERIA, Indonesia, Malaysia, and Thailand. ERIA emphasised that when the MEEI produces EEIs – not energy intensity – a detailed energy consumption survey of each final energy sector is needed. ERIA committed financial and technical assistance to the MEEI in the understanding that the latter will produce the country's EEIs during phase 2.

Phase 2 started in July 2019. The ERIA team, comprising four energy efficiency experts on the residential and commercial, transport, and industry sectors and on EEIs, visited the MEEI office in Ulaanbaatar, Mongolia for detailed discussions with MEEI staff on sampling methodology, questionnaires, expected EEI for each final sector, etc. Following this meeting, MEEI staff conducted a survey on actual energy consumption with remote technical support from the ERIA team. This report mainly described the survey results. Despite the lack of experience of MEEI staff to conduct energy consumption surveys (this being the first time for the institute) and limited sample numbers, the MEEI obtained several significant results from the survey.

The residential sector has two types of energy use: (i) space heating and cooking, and (ii) electricity such as for lighting, TV, and refrigeration. For space heating and cooking, coal and biomass are the main fuel in rural and herder areas. Households in urban areas use less coal and biomass compared with rural and herder areas. Stand-alone houses consume most electricity followed by apartments and *gers* (Mongolia's traditional dwellings). End-use of electricity in urban areas depends on the type of house. Many stand-alone houses in urban areas consume electricity for space heating, followed by cooking, refrigerator, and water heating. Apartments in urban areas consume electricity for cooking, refrigeration, and water heating. *Gers* in urban areas show an end-use pattern of electricity consumption similar to that of apartments. Urban households are shifting from coal and biomass to electricity, including for space heating. On the other hand, rural and herder areas still depend on traditional fuels, such as coal and biomass. Looking at the EEI in the residential sector, defined as energy consumption per floor area ($kWh/m^2/year$), stand-alone houses are most efficient (201.4 $kWh/m^2/year$), followed by apartments (278.7), and *gers* (313) in urban areas. Other areas show the same trend. This indicator consists of electricity and heat from coal and biomass, and heat demand is much higher than that for electricity. Heat demand is around two to four times higher than that for electricity, and it depends on the type of house. If we compare the indicators for urban and rural areas, those for rural areas tend to be higher.

This survey covers only the road transport sector, i.e. cars, buses, taxis, and trucks. In terms of fuel consumption, taxis are most efficient at 8.0 litre/100 km, followed by cars (10.3) and buses (35.4). Regarding travel distance, buses are highest at 241 km/day, followed by taxis (234), and cars (49.4). Comparing efficiency of rail and road using tonne of oil equivalent (toe)/passenger and tonne km, that of rail is much higher than road and is consistent globally.

The industry sector uses both coal and electricity for its energy needs, but coal is dominant. The sector is made up mostly of the manufacturing and the mining sectors. The energy indicators of the manufacturing sector are larger than those of the mining sector, 275.31 toe/million US$ and 11.02 toe/million US$, respectively. The manufacturing sector mainly consists of food, construction materials such as cement, basic metals, and others. Metal and cement consume a lot of coal for heating – their energy indicators are 172.9 toe/million U$ and 98.03 toe/million U$, respectively, which is much higher than for food and others.

The commercial sector consists of five building types – hotels, offices, restaurant, shopping malls, and hospitals. From the survey results the MEEI obtained the following energy indicators: 865 kWh/m2/year for hotels, 495 for offices, 808 for restaurants, 591 for shopping malls, and 682 for hospitals. The order of the energy indicators by building type is appropriate but the absolute values of energy indicators are much higher than for ASEAN countries. Despite the difference in climate and environment between Mongolia and the ASEAN region – heating energy demand is dominant in Mongolia but cooling demand is in the ASEAN region – the values of energy indicators by building type are too high. Appropriate and implementable energy efficiency policies and action plans will be needed, therefore, to mitigate energy consumption in the commercial sector, especially electricity consumption.

The detailed energy consumption survey for Mongolia, implemented by the MEEI with the support of ERIA, has been successful as several meaningful EEIs were extracted from it. But the MEEI needs to improve its capacities to be able to better analyse the sample data generated through the survey. Such analysis would include an assessment of possible bias that may be present in the sampled data (overestimation or underestimation), finding outliers to produce more appropriate EEIs, gaining a correct understanding of actual energy usage in the final sectors, and gaining an exact understanding of the meaning of EEIs. The MEEI's capacities will be upgraded through repeatedly undertaking energy consumption surveys and through training to be provided by the countries of the Organisation for Economic Co-operation and Development, such as Japan, and international organisations such as the Asian Development Bank and ERIA.

Finally, ERIA suggests that the MEEI repeats this survey every 3 or 5 years and analyses the historical trend of the EEIs for each final sector. Regularly repeating the survey is essential for promoting appropriate energy efficiency and conservation polices to mitigate energy consumption in Mongolia – especially of coal, oil, and electricity.