Technology Fact Sheet for Mitigation

Technology 1: **Improved insulation of panel apartment buildings** [i]

Subsector	Commercial, Residential Energy Consumption
Sector GHG emission (tCO_2-eq)	1,425,000 tCO_2-eq in 2006
Technology Name	**Improved insulation of panel apartment buildings**
Background/Notes, Short description of the technology option sourced from ClimateTechWiki, Seminars, etc	Ulaanbaatar is the world's coldest national capital city with an eight month heating season, a winter design temperature of -39°C, and winter temperatures frequently falling to -30°C at night and -20°C in the daytime. Around 500 panel apartment buildings house around 200,000 people or around 20% of the population of Ulaanbaatar.The precast panel buildings have no added external wall insulation, have poorly insulated external doors, poorly insulated roofs, and still have mostly old double wooden framed high air ventilation heat loss windows. The panel buildings' hot water radiator heating systems have no heat output controls. Apartments have no heat consumption metering fitted. Thus building managers and apartment owners lack both financial incentives and the technical means to reduce excessive heat losses or reduce overheating.The Ulaanbaatar panel buildings will continue to be used for many years.
Implementation assumptions, How the technology will be implemented and diffused across the subsector?	GHG reductions will be achieved as a result of energy efficiency measures undertaken at 2 big pre-cast panel buildings with 792 apartments in Ulaanbaatar. The energy efficiency measures will lead to a reduced demand for apartment space heating in winter from the local heating loop supplied from the heat substation. The reduced heat demand from the heat substation will reduce the heat demand from the primary hot water heating loop supplied from the coal fired Combined Heat and Power plant No 4 (CHP No 4) in Ulaanbaatar. The reduced heating demand from CHP No 4 will lead to a reduced demand for coal, which will lead to reduced anthropogenic GHG emissions (1) from the reduced heat losses achieved by adding wall, roof, ground floor and basement insulation, from fitting improved insulation level windows and from reducing uncontrolled air infiltration; (2) from the new ability of the apartment occupants to control their space heating energy supply and (3) from the new incentives for the apartment occupants to manage any overheating by adjusting their thermostatic radiator valves, arising from the fitting of apartment heat consumption meters that measure an apartment's actual space heating use which would then be used in the new heat consumption tariffs.In the

	future, up to 2030, all panel apartment buildings will be improved by implementing the above energy efficient measures.
Reduction in GHG emissions	GHG emissions are expected to be reduced by 492,000 tCO_2-eq
Impact Statements - How this option impacts the country development priorities	
Social development priorities	- Living conditions of the residents will be improved; - Financial income of the people will be increased;
Economic development priorities	- Heat energy costs of the apartments will be reduced. - Reserve capacity for the city's heat sources will be set up and this reserve source can be used for heating of apartments planned to be built in future.
Environmental development priorities	The project will contribute towards a reduction of the severe winter pollution that causes Ulaanbaatar residents to have winter respiratory problems, causing chronic winter illness and lowered human productivity
Other considerations and priorities such as market potential	-
Costs	
Capital costs	The investment cost of 792 apartments will be 6 million EURO (7.5 million USD) according to the Ulaanbaatar Apartment Buildings Energy Efficiency Project. For improvement of all existing 500 panel apartment buildings (about 30000 apartments) will require 284 million USD. Assuming a life time of 30 year the annualized cost would be around 9.47 million USD.
Operational and Maintenance costs	Ulaanbaatar Apartment Buildings Energy Efficiency Project could save heat energy of 161 kWh/m^2year. 792 apartments will save heat energy of 6,377 kWh (5,496 Gcal). Assuming that the real cost of heat energy is 3 times more than existing heat tariffs for households (7.44 USD/Gcal) the cost of saved heat energy will be 122.7 thousand USD. The cost of saved heat energy for 30000 apartments will be 3.68 million USD. The total operational and maintenance costs will be 5.79

	million/USD per year.
Cost of GHG reduction	According to the Ulaanbaatar Apartment Buildings Energy Efficiency Project, the GHG emissions from improvement of 792 apartments are 12,988 tons ofCO_2-eq. GHG emissions from 30000 apartments will be 492,400 tons ofCO_2-eq. GHG emission reduction cost will be 11.76 USD /tCO_2-eq

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment For Climate Change Mitigation– Mongolia. You can access the complete report from the TNA project website http://tech-action.org/**