

ICM for Heating Stoves Project in Ulaanbaatar

As of June 30, 2007.

Results

Close to 16,940 improved Ger heating stoves have been disseminated in Mongolia since 2001¹, mainly in Ulaanbaatar, potentially reducing coal consumption by some 24 thousand t/yr during the 2005/2006 heating season and an expected 40 thousand t/yr during the latest heating season, resulting in about 1% reduced coal consumption and 1.7% reduced air pollution contribution from Ger heating stoves. It took the Project Implementation Unit some time to define the most suitable dissemination mechanism that was able to cope with high stove production costs, low household incomes in Ger areas, and institutional and political difficulties. Even though about half of all new stoves now sold during the 2006/2007 season are improved, the dissemination mechanism is not sustainable yet and it is likely that sales will quickly tumble once project support terminates. Improved stoves are a relatively easy way to substantially reduce air pollution.

Why heating stoves

Environmental pollution in Ulaanbaatar is far worse than normally allowed by WHO standards with an obvious impact on people's health. During the winter the city's three CHP plants, some 400 small heat only boilers (HOB), and about 134,000 heating stoves in the Ger districts use low-quality coal thereby discharging large quantities of particulates and noxious emissions into the air. An accelerated influx of ex-herders without job almost doubled the number of Ger households in Ulaanbaatar between 2000 and 2004 as a reaction to two extremely harsh winters and a high rural unemployment rate.



Figure 1: TT-03 improved ger heating stove model

Total coal consumption for 2006 was estimated at about 5.0 million tons. Although Ger heating stoves account for only 13% of the total coal consumption, they are probably the largest contributor to noticeable air pollution in Ulaanbaatar since CHP plants emit at high altitude and HOB at intermediate altitude. Ger heating stoves emit at ground level, causing a blanket of smog over town every morning and early evening. Air quality-monitoring shows that the mean annual concentration of sulphuric dioxide (SO₂) has more than doubled between '94 and '00, following population growth².

¹ Of the 16941 stoves disseminated, 8000 were distributed by MNE.

² Air pollution is proportional to the consumption of coal, but a factor differentiating the real effect on ground level pollution has been applied as follows: coal consumption of ger heating stoves accounts for 100% , consumption by CHP for 25% (due to the high stack), and consumption by HOBs for 75% (due to the intermediate stack).

SO₂ concentrations are highest in the winter and peak in the evening between 4pm and 8pm; in 2006 the maximum SO₂ concentration reached in December was 2.5 times higher than what is normally tolerated for health reasons. Treatment requests for chronic diseases such as tonsillitis and asthma increased by 1.8-2.5 times between 1996 and 2005.

Air pollution control at the not-so-new CHP plants will require substantial retrofitting and expensive public investments; HOB regulation lags international standards and the most likely solution - upgrading or changing to new and efficient boilers - will be expensive for private owners. Ger heating stoves thus remain the only practical and realistic solution not requiring heavy investments. The project's experience shows that air pollution can be reduced quite substantially through increased Ger heating stove efficiencies. The economic justification for such activity is high: the total public investments in the stove program of US\$750 thousand over 6 years resulted in private coal savings of US\$ 1.2 million during the 2006/7 heating season alone and these savings were absorbed by the poorest section of the Ulaanbaatar population.

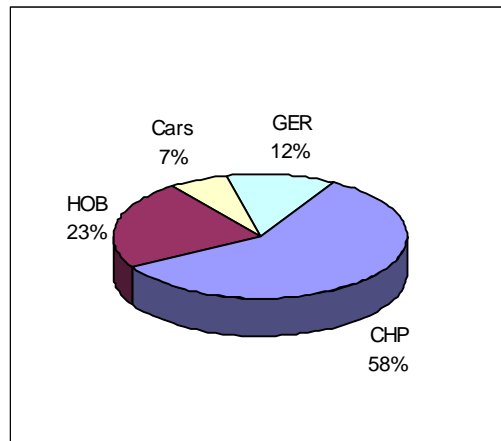


Figure 2: CO₂ emission by origin

The project as designed

The project started in 2001 and was executed through a semi-autonomous Project Implementing Unit (PIU) governed by the Ministry of Nature and Environment (MNE) in partnership with the Ulaanbaatar City Municipality (UBCM). A formal Memorandum of Understanding between MNE and the Ulaanbaatar City Municipality (UBCM) was not signed until 2004 regarding activities and responsibilities of the Municipality's and MNE's staff. The planned Steering Committee, to be chaired by the Vice-Minister at MNE and comprising representatives of the different stakeholders, including the Municipal Government, has also not met until 2004. Once the SC started to meet, most coordination problems were quickly solved. The PIU arranged for project execution through experienced local NGOs.

The project was set up with five main components: (i) quality assurance to ensure that good quality certified stoves are available on the market; (ii) capacity building, to provide assistance to the manufacturers of such good quality stoves; (iii) new project facility, to identify new stove models and other ways to reduce emissions and fuel consumption; (iv) social marketing, to raise awareness among consumers about the new stoves and (v) monitoring & evaluation, to monitor progress and fine-tune the approach if needed.

The project as actually implemented

With the institutional arrangements not clearly defined, implementation was difficult from the start. With a parallel stove program implemented for political motives it was next to impossible to develop market mechanisms. It took the PIU a long time and much persistence in building up relations with Khoroo stakeholders and artisanal stove producers to change the perceived view that improved stoves should be obtained for free.

To select the most acceptable stove, a contest among stove manufacturers was carried out yielding four different stove models each complying with the newly created national standard for improved stoves, MNS 5216:2002. Laboratory tests of these stoves showed fuel savings of 40 - 55% and reduced emissions of smoke by a factor of 4 and of particulates by a factor of 6. The stoves were also tested in the field by about 2000 households and consumer satisfaction surveys were carried out in 2002 and 2003 with a result that only the TT-03 stove model was selected for large-scale dissemination. The retail price of the stove, reflecting full cost of production, was about Tg 62,500 (\$54), or about 60% more expensive than a traditional stove (Tg 39,500) in 2002 and this had doubled in 2006 to Tg 84,000 due to the rapidly increased steel price. Normal winter season consumption with a traditional stove is approximately a truck-load³ of 5 t of poor quality coal⁴ and this can be reduced to 2.7 t or less with an improved stove. This implies that households can pay back the full investment of an improved stove in about one year.

Capacity building among stove producers took place first to identify the optimal stove model for large scale production and ways to reduce the initial costs. Later on assistance was provided to smaller-scale producers too, who are actually producing the 3000 - 7000 traditional stoves that are normally sold per year. The original idea also called for the production of a low-cost insert⁵, which can be used with a traditional stove to improve its combustion characteristics, but this idea never really took off and less than 900 were disseminated over the whole project period.

Despite the fact that many households complained about high fuel consumption, they either thought that improved stoves should be obtained for free or that their traditional stove did not need replacement. Raising consumer awareness therefore has been key to the success of the program also the reason why the PIU was eventually able to create a market for improved stoves. Multiple marketing activities have been organized throughout the project period including demonstrations, flyers, newspaper articles, exhibitions, TV programs on the existence and proper usage of improved stoves and heating walls, ways to reduce fuel consumption. The main elements that led to the success were: promoting after-sales service and guarantees, creating a better production and marketing infrastructure, and providing financial assistance.

Once the after-sales service concept was adopted, households appreciated the fact that the manufacturer came to check on their stove performance – but manufacturers found out that they are better at producing stoves than at providing service. As a result, a Ger Stove Association (GSA) was created and now has some 20 members providing training on improved stove use on behalf of stove producers. The association is now also developing training courses for Khoroo officials, vocational training centers and other schools. The association was also helpful in providing feedback to the PIU and as an example, some 15% of household complaints about the improved stove were actually related to the attached heating wall, which allowed the PIU with assistance from the university, to develop a modified heating wall that overcame the indicated problems.

Additional workshops were set up with assistance from the PIU and now some 225 trained technicians service and improve heating walls and 15 trained technicians service traditional stoves in Ger areas and install improvements kits.

To raise awareness even further and to improve the retail infrastructure, an Open Market Center (OMC) was set up as an alternative to the traditional Narantuul market that had been the only place to buy stoves. Much of the initial awareness at the Khoroo level was created through the OMC which groups together a few retailers and maintains links with producers using high quality standards; some 3 more OMC are expected to be created soon.

Some 60% of the poor in Ulaanbaatar live in Ger areas with average monthly income levels of about 116k Tg (NSO 2006). This does not leave much room for long-term investments and one of the greatest challenges for the PIU therefore has been to develop support mechanisms so that the poorest households could also obtain fuel efficient stoves. A great achievement has been that the PIU was

³ About Tg 160,000 per truck or \$30/t; the price of coal if purchased in bags is about \$54/t

⁴ On average 14.7 MJ/kg

⁵ Tg 10,000 or less than \$10.

able to set up two financing mechanisms: XAS bank provides loans for certified improved stoves sold through OMC and some 100 households opted to do so; another even more interesting option has been the support through the Output Based Approach program where households can benefit from a \$25 reduced sales price when buying a stove from selected manufacturers.

Use of OBA approach

The Output Based Approach seems to be the most promising mechanism to accelerate the use of more efficient heating stoves. Despite the fact that a pilot phase based on OBA started only on the first of October 2006, just after the peak sales period for heating stove that normally starts in August, some 3000 improved stoves were bought. This shows the high interest by household for buying an efficient stove at reduced costs.

With OBA a tender is organized for the delivery of a large number of improved stoves; these stoves are sold at reduced prices via the established marketing channels. Some four manufacturers have gained access to this facility and stopped producing traditional stoves.

To follow up on the pilot phase that used remaining funds from the Project Budget, financial support for the OBA program was found from the ADB. The Ger Area Improvement Project (Mon 90-15) provides, among others, micro credit to consumers. Some 3500 additional improved stoves are expected to be disseminated prior to August 2007. If this happens, for the first time more improved stoves will have been bought than traditional ones within the period of a year.

Results

An interactive method was used to identify the most appropriate Ger heating stove, involving manufacturers, retailers, and consumers. This resulted in a good stove model that was perfectly acceptable by consumers. The main problem is its production cost, as both more steel and more labor is needed than with a traditional stove.

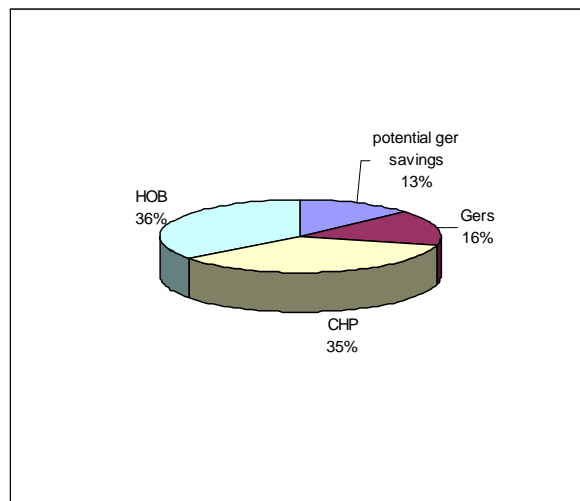


Figure 3: Noticeable Air pollution Contributions

Figure 3 shows the current situation of noticeable air pollution by origin; the Ger heating stove contribution is broken up in two parts: the part that can be eliminated if all households use an improved heating stove and the part that will remain in place. The 45% of the Ger contribution that can be avoided is shown as the “potential ger savings”.

Almost 16 thousand improved stoves were disseminated since 2001⁶, compared to over 27 thousand traditional heating stoves over the same period. This is by no means a poor performance as almost 39% of all new heating stoves over the past 6 years have been improved ones. The first few years

⁶ Of which some 8000 distributed by MNE for free.

some 8000 improved stoves were given away for free and this has been a major bottleneck for the project as it really dampened the development of normal market mechanisms. Eventually the PIU managed to correct this and during the last heating season 06/07 alone some 3000 improved stoves were actually sold, albeit at reduced prices, and 3500 are expected to be sold yet.

The PIU was able to instate and promote standard after-sales service levels. Households appreciated this and for that reason it is therefore also likely that most will have a maximum reduced fuel consumption level. If all these improved stoves were able to reduce consumption according to laboratory performance, Ger population coal consumption between 2001 and 2007 would have been reduced by 106 thousand t, with a value of US\$ 3.2 million⁷. This compares favorably to the total investments realized of US\$ 0.75 million for the project and US\$1.1 million for the stoves⁸.

Total annual coal consumption in 2006 is about 5 millions t, of which an estimated 0.67 million t for Ger household heating (13%). It is likely that smog and smoke from Ger households have a higher effect than CHP stations as these have smoke stacks and much of the smoke will be blown away. The effect of the improved stoves is therefore more important than what follows from the proportionally reduced coal consumption. The potential smoke and emission reduction from Ger heating stoves is 40-55% and this will have an enormous impact on Ulaanbaatar households. This impact will be noticeable to every inhabitant and not only the Ger population through better health conditions. Ger households will have the added benefit of financial savings from reduced fuel bills.

The project has also been a success from a global environmental point of view. Some 159 thousand t of CO₂ emissions have been avoided as a result of the coal savings induced by the project so far. An additional 58,500 t of CO₂ emissions will be avoided annually - even if no more new stoves are sold. Over a 20 year horizon the cost to avoid CO₂ emissions through the stove program is roughly US\$0.82 and this is low compared to some of the alternatives. This shows that it is fully justified to invest in improved stoves just for global environmental reasons.

Lessons learnt

Heating stoves are an interesting but often neglected developmental topic that could have an impact on several sectors: stoves consume and emit more than necessary and they are used by the poorest of the economy. With some persistence and a good approach, it was demonstrated that an improved stoves program can make a real difference for the poor and for the local and global environment. Economic benefits resulting from such program can be very high, as was demonstrated here.

For such a program to work however, one must ensure that an appropriate stove model is selected by households and the stove producing community. Although this was done, it took the PIU some time to focus on those who were really producing and selling traditional stoves. Once the responsibilities and benefits for the traditional stove producers and retailers became clear to them, they adopted the ideas and became a major thrust of the project.

Creating market-based mechanisms is more difficult than often thought. Major interference came from public institutions still operating under the planned economic approach. Handing out free stoves is a good example. Allowing second hand steel to exit the country for short-term gains is another example. The project demonstrated that the transition to market-based stove production has economic benefits at many levels, ranging from consumers, stove producers, stove retailers, but also MNE, MUB, Khoroo administrators, etc.

Some financial support is necessary, and the OBA approach turned out to be a good mechanism to use. This was started late but showed nevertheless what can be done to give a serious push in the right direction of obtaining universal use of improved heating stoves. Although maybe half of all heating stoves sold in Ulaanbaatar now, the production mechanism is not yet sustainable and still depends on the support mechanisms created under the project.

What to do now

⁷ At US\$ 30/t for household coal.

⁸ At an average production costs of \$65.

Although many other ways exist to reduce air pollution, the almost completed World Bank supported improved heating stove project is the first to have actually demonstrated some results on the ground. Heat energy demand management at the end-user level, improved CHP and HOB efficiency, better traffic management, require substantial investments and a level of organization that make these not easy to realize. Intervention through improved heating stoves is relatively easy and low-cost, and with appreciable results. Particularly the OBA approach applied lately is very promising and should be given a chance to come to fruition. It is therefore recommended that project activities will be continued and expanded, building on the above lessons learnt, until the activity has become sustainable and traditional stoves are on their way out.

The air pollution problem in Ulaanbaatar is severe enough that an integrated strategy for reducing it may be unavoidable; such a strategy should include realizing reduced emissions from all sources (CHP, HOB, Ger, and transport), fuel substitution, fuel upgrading, and heat demand side management. Ger heating stoves should figure prominently in this approach.

