

goats and soda

To Fight Pollution, He's Reinventing The Mongolian Tent

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Odgerel Gamsukh has started a company to create a green community in the unplanned and polluted sprawl outside of Ulaanbaatar.

Katya Cengel for NPR

It takes the taxi driver three tries to find the neighborhood and at least another three

wrong turns on narrow unpaved roads before he locates the company's front gate. Each time he gets turned around the driver reaches for a cell phone. On the other end of the line Odgerel Gamsukh directs the driver to Gamsukh's garage door business. Neither man seems bothered by the multiple interruptions and resulting delay. Mongolians are used to it taking a little extra time to get around, especially in the ger areas of Ulaanbaatar.

If street addresses mean little in the city center, where residents commonly give directions based on landmarks instead of street names, they mean even less in the surrounding ger areas, named for the circular felt tents in which many residents live. In these neighborhoods, the route that takes you from one place to another is sometimes a grass-covered hill. That is because the government has yet to catch up with the city's rapid growth. Sixty years ago only 14 percent of Mongolia's population lived in the capital of Ulaanbaatar, the country's largest city. Today it is approximately 45 percent, more than one million people. The majority of them, 60 percent, live in ger areas that often lack basic services such as sewer systems, running water and trash collection. The coal that area residents burn to warm their homes is the main cause of winter air pollution that now rivals Beijing's.

It is out of this unplanned and polluted sprawl that Gamsukh is determined to create a green community. If that sounds difficult, his next goal – honoring Mongolia's nomadic past while at the same time creating a sedentary community – seems almost impossible. Yet that hasn't stopped the 34-year-old power plant manager turned architect, just like he didn't let the frozen ground stop him from attempting to install underground pipes last winter.

It did slow him down, just as a lack of funding slowed construction of his company's environmentally friendly office and warehouse. It is Gamsukh's doggedness that others working in the ger areas admire, including Badruun Gardi, whose non-profit social enterprise, GerHub, is also focused on making individual gers and ger neighborhoods more eco-friendly.

Gardi is not an engineer or an architect or even an entrepreneur like Gamsukh. He studied cultural psychology. Like Gamsukh, he is in his 30s and is working in the same district, Songino Khairkhan. He was drawn to the ger areas because of the extreme pollution and a need for a solution. Gamsukh grew up in the ger area where he built the company office and remembers how empty it used to be, a natural playground where he could catch grasshoppers. In time more and more immigrants came, each claiming a little more of the land for their families until the open area was divided into small plots of land marked by large fences. Under Mongolian law, every Mongolian is entitled to a free plot of land, making it hard for the government to control growth.

Blame The Mountains, The Valley — And Coal

In December 2016, Ulaanbaatar experienced pollution levels five times higher than in Beijing, sparking a public outcry. Despite a new national program aimed at reducing air pollution, the situation has not markedly improved. Heavy coal burning combined with unfortunate geography – a valley surrounded by mountains – have helped the city become one of the world's most heavily polluted. According to a 2011 study published in *Air Quality, Atmosphere and Health* by Ryan Allen, an assistant environmental health professor with Canada's Simon Fraser University, one in ten deaths in the capital can be attributed to air pollution.

Those most affected are children whose immune systems and lungs are not fully developed. Fine particulate matter — PM 2.5 — increases the risk of respiratory infection in children. In Ulaanbaatar PM 2.5 is usually six to seven times the World Health Organization allowance, but can be as much as 25 times higher. One of the leading causes of death for children under 5 here is acute lower respiratory infection, accounting for 15 percent of under 5 childhood mortality cases under age 5.

On January 30, PM 2.5 levels of 3,320 micrograms per cubic meter were reported in the capital, 133 times above WHO recommendations, according to UNICEF Mongolia. A joint report by UNICEF and the Mongolian National Center for Public Health titled "Mongolia's air pollution crisis: A call to action to protect children's health" warns that

orange tint, comes off as artistic. But the sketches he produces are not dreamy musings. They are technical drawings supported by mathematical calculations. They are solid, like the sturdily built Gamsukh. Many are already being implemented, including a partially completed passive solar heated immobile ger that adds windows, insulation and solar collectors to the traditional model. Passive solar heating design uses windows, walls and floors to collect, store and distribute heat in the winter and reject it in the summer. Designs vary depending on the climate in which they are built, but shade can be used to block the sun in summer without taking away from warmth in winter because the sun is higher in summer.

When it is finished, Gamsukh plans to call it home. He is also testing another modified ger that uses solar power and those underground pipes he tried to dig in winter for heat.

The only project he has not yet attempted to take beyond the drawing board stage is the neighborhood kindergarten. Like other government-provided services, schools are in short supply in ger areas. The design itself is modeled after his company office – his first experiment in sustainable architecture. His inspiration was Earthship, a passive solar house first constructed in New Mexico in the 1970s made of natural and upcycled materials by pioneering architect Michael Reynolds. Gamsukh thought the model would work well in ger areas because it didn't require a lot of infrastructure or outside building materials.

"You can just build wherever you are, like the earth you're sitting on," says Gamsukh.

Old Tires Aren't Cheap — But Dirt Is



Odgerel Gamsukh has constructed a greenhouse as part of his company's environmentally friendly building.

And that is pretty much what he did when he began constructing his office in 2013. Of course, his Mongolian model had a few alterations. Old tires, the material used for exterior walls in original models, are not cheap in Mongolia, so he went with something that was – dirt. Gamsukh points to the inside wall of the office's main room, it is held up by bags of dirt. He moves into the kitchen, pointing out how the ceiling is supported by scaffolding salvaged from a construction site. The strawberries in the sink come from the indoor garden warmed by the south-facing wall made entirely from sheets of salvaged glass.

Because Gamsukh had limited funds – the entire project cost five million Tugriks or about \$2,000 – he wasn't able to include as much insulation as he would have liked. As a result the structure is only 70 percent effective at heating itself, which is not enough in an Ulaanbaatar winter when temperatures can fall to 20 below zero Fahrenheit. Gamsukh built a rocket stove, an efficient stove made from found materials that sucks smoke or soot into a burn tunnel where they combust instead of being blown out as they would in a normal fire to make up the difference. He claims the stove is so efficient at burning coal that the end product is not black smoke but a white vapor. Like everything else, he learned about it in a book and through YouTube videos. That is because in Mongolia both the problem, air pollution, and the solution, green building, are relatively new. Although traditional Mongolian culture involved a close relationship with nature, modernization has changed that, says Tungalag Ulambayar, adviser to the Minister of Environment and Tourism.

When nomadic people moved to towns they didn't question whether the ger, perfect for the uncertainty of the Mongolian plateau, would be suitable for urban areas.

"People think, that's our home so we can just bring it, settle in," says Ulambayar.

A 21st-Century Ger

Portable, lightweight, cool in the summer and easily warmed in the winter by burning

animal dung, gers are the perfect housing for nomadic herders, explains Gardi of GerHub. In the city though, they become "one of the worst kinds of housing" options. Without access to livestock and their dung, ger inhabitants rely on coal for heating. It is the same fuel they use to heat the simple wood homes that some build to replace their gers. Because Mongolians lack experience building houses, the buildings are poorly insulated and often lack basic infrastructure, says Gardi.

Instead of starting from scratch, Gardi and his team at GerHub struck on the idea of building off what almost every Mongolian already has, a ger. They plan to slowly make them more efficient by plugging each into an assembly that has a lot of the infrastructure that's missing in the ger district such as a toilet system with gray water recycling, a shower with its own tank and electric heating through a radiator and under floor heating system. Many ger residents can access electricity thanks to a government program that offers free electricity at night to ger area residents in an effort to encourage them to use electricity instead of coal. The plug-in is incremental and affordable, and residents can customize, choosing the features they want "almost like a Lego," says Gardi. Over time he expects owners to remove the ger and use the plug-in as the foundation on which they build a house.

Working with Rural Urban Framework at the University of Hong Kong and other partners, GerHub completed a plug-in prototype in the summer of 2017. The cost, \$14,000, is too high in a country where the average annual income was \$3,550 in 2016, according to the World Bank. Gardi wants to get it down to \$8,000, about what he has seen people pay to build simple wood homes in ger areas. GerHub will not be building dozens of plug-ins, instead they want to use the plug-ins to inspire other individuals and groups to continue to experiment with the model and improve on it.

"We're showing the possibilities," says Gardi.

Those possibilities don't end with the plug-in. GerHub is also looking at smaller more affordable fixes like a \$20 polycarbonate sheet that can temporarily seal the opening in the top of a ger. The clear seal will allow light in but also keep cold out. Gardi is

testing the invention this winter. Even if it fails, Gardi will consider it a success of sorts.



Gamsukh's company foreman, Chingis sits in his family's ger with his wife, Suydaa, and son Burkas, 3.

Katya Cengel for NPR

"I think people just have to try things out," he says. "So for GerHub, what we do at any given time, we want to have say ten projects going in tandem all with different partners. And nine of them may completely fail." If one project is successful, that is enough for Gardi.

Everybody's Coming To Ulaanbaatar

Gamsukh's company foreman, Chingis, is incorporating a number of heat-saving techniques into the wood home he is building in Songino Khairkhan, including thick

insulation and south facing windows. Chingis believes anything that helps reduce the amount of coal burned in winter is worth the effort. Although more coal is burned in the ger areas than in other areas of the city, he still prefers living here.

"I want to build something with my hands. My wife wants to grow vegetables," he explains. "In city center you can't do that."

Gamsukh also sees the freedom and possibility but recognizes that most outsiders view ger areas in a different light.

"Foreign visitors talk about ger district (area) like a ghetto," he says.

That isn't what Gamsukh sees. He sees young men, former nomads like Chingis, who moved to Ulaanbaatar after high school in search of a better future. People filled with energy who understand the danger air pollution poses and want to do something to change the way they live.

Climate change is one reason cited for the migration. In recent years, Mongolia's rate of average temperature increase has been three times higher than the global rate. This dramatic change in temperature has been blamed for an increase in the number of dzuds, extremely cold winters following dry summers that result in the death of a large number of livestock. The dzuds in turn have been cited as one of the driving forces of migration to Ulaanbaatar. The government has tried to prohibit migration to the capital.

Experts like Ulanbayar, with the Ministry of the Environment, believe migration is influenced by a number of factors such as family, education and a general trend toward urbanization. In Ulaanbaatar this urbanization results in ger areas. Although they are often called ger districts, they are in fact neighborhoods or khorros within the city's nine districts, explains Enkhtungalag "Tunga" of the non-government Ger Community Mapping Center.

"It's not informal settlement," says Tunga. "It's just unplanned settlement."



Kids boat in the community lake.

Katya Cengel for NPR

While she hopes the government will eventually service the ger areas, Tunga believes the best solution in the meantime is for residents to be proactive in improving their own living situations. It is the people living in the ger areas after all who know the problems and possible solutions best, she says. People like Ulzii Togtoh who turned a trash-filled crater in the 12th Khorro in Chingeltei District into a scenic lake where people can boat in summer and ice skate in winter.

"Life in the ger area is hard. Starting from the soil there is not much greenery in the ger area," says Togtoh.

He wanted a place where children could play in the outdoors so he leased the land from the government and invested his own money in cleaning it and building a lake

house for the community. Solutions like this are not something the government is in a position to provide at present, says Tunga.

"You can't really simply expect the government, who's already in a lot of debt, to be providing infrastructure to ger areas," she says.

A Shortage Of Kindergartens

Ganbat Badamtsetseg is governor of the 31st Khorro in Songino Khairkhan District where Gamsukh is working. The khorro was founded in 2011 and still doesn't have a paved road, sewage system, running water or adequate schools. There are 2,000 kindergarten-age children and just one kindergarten originally designed for 50 children, says Badamtsetseg. Her annual budget is whatever she can talk the government into providing. This year she asked for about \$8,433,000 to pave a road and build a school and kindergarten.

She received about \$8,500. Unlike in the khorro where she last worked, which was composed of apartments and not gers, there are no large businesses in the ger area to help fund improvements. There is also no space. Badamtsetseg unfurls a large map of her khorro pointing out where her 13,000 residents live and the lack of empty space.

"The problem with building a kindergarten and school is the public land," Badamtceceg says. "There is no land to build it on."

Like Tunga, her hope for change lies with local residents, people like Gamsukh.

"Right now, since we can't build a big apartment here and put everyone in it, this passive solar building is our best way to reduce the pollution and give more comfort," she says.

She credits Gamsukh with being the first person to unite and organize people toward green and sustainable building to reduce air pollution in the 31st Khorro. For the last half decade he has come to almost every khorro meeting to talk about green building.

Now, she believes, people are listening. This year ten 31st Khorro families won a government-funding competition for their proposal for an electrical heating system and another 38 families are applying for non-governmental funding for central heating.

In addition to the groups Badamtsetseg mentions, Gamsukh has established his own neighborhood association. He counts several hundred members, 34 of whom pay dues. One of them is a 43-year-old metal worker who goes by the nickname Bilge. When he first moved to the capital, Bilge stood on the side of the road with a sponge and bucket and washed cars. His home was an empty ger. Now he lives in a wooden house, which includes an adjacent metal working workshop. Having his home and business in the same location is one advantage of the ger area, but Bilge wants to see more resources in the 31st Khorro like internet and banks.

"I'm tired of waiting for the government to take action," says Bilge. "It's like empowerment, we can make change."

Like Gamsukh, Bilge is a self-starter. When he wanted to incorporate some of the traditional Mongolian culture into his modern life he found someone to teach him archery and someone else to instruct him in throat singing. He has been known to interrupt conversations to demonstrate his skills in the guttural style of singing.

"As Mongolians we have a lot of great traditions, but under communism it was separated," says Gamsukh, who is also learning throat singing. "Now our generation is trying to figure out our traditions."

That is why even though Chingis will soon have a new efficiently heated wood house he will still keep his ger, ensuring the ger areas maintain their name and cultural history without the pollution. Chingis plans to use his ger as a guesthouse and summer play area for his kids so he doesn't have to "just lay it down".

"Me and my wife grew up in a ger," says Chingis. "We want to keep the tradition alive to pass to our children."

Katya Cengel is the author of the upcoming "Exiled: From the Killing Fields of Cambodia to California and Back." She reported from Mongolia on a fellowship from the International Reporting Project (IRP). You can find her on twitter @kcengel

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