



GREENHOUSE of GLASS

Problem solving through improvisation,
a team from UVA sets a new standard



Traveling approximately 6500 miles from Charlottesville, Virginia, two businessmen were off on an adventure in a remote landscape. Dr. David Martin and Ken Dabkowski of M-CAM, Inc., a global, full-service innovation and intangible asset management firm, traveled with Ts. Enkhtuya, vice president of the Mongolia National Business Incubator Federation (MNBIF), and a team from the MNBIF. They had originally come to attend a reception put on by EBI Think Tank Institute in Ulaanbaatar and to meet with government officials, but they had an opportunity to travel outside the capital city and explore the South Gobi Desert.

In the two decades since Mongolia's peaceful transition to democracy began, the country has been developing slowly but steadily, and Charlottesville-based company M-CAM's mission in Mongolia has been to contribute to development by engaging broader communities and by increasing the possibility of using modern, eco-friendly technologies. During the course of their 2010 travels, Martin and Dabkowski were able to interact with local Mongolian agricultural workers who expressed their desire to extend the growing season for tree seedling and vegetables.

Green Technology

Martin and Dabkowski identified a pathway for aligning the desires of Mongolian farmers with the country's abundant resource of glass. By doing so, they were able to develop a highly valuable green technology; for the country—by melting down glass bottles to create greenhouses, enabling Mongolian farmers to extend their growing season.

By taking an integral trade view and assessing the abundance around them, they realized not only did the area have recycled glass, but that the Hasu Shivert Resort, which is located sixty kilometers from Ulaanbaatar and features a wellness center with many recreational opportunities to explore the Mongolian countryside, had an abundance of hills, hot springs, geothermal heating, knowledge and much more.

COMPILED BY WHITNEY PAUL



“The real point of what we do at M·CAM is to demonstrate pathways to options and possibilities ... global connections are important. Positive ambassadors are important. Innovation and collaboration tests between cultures are beneficial.”

-Ken Dabkowski

Connecting In The Community

After returning from their initial trip, the network for the project began expanding as Dabkowski contacted Bill Hess, a local glass engineer from Afton, Virginia. Soon after, this unique project caught the interest of the University of Virginia, more specifically, the Jefferson Public Citizens Group.

The UVA Jefferson Public Citizens group supports community involvement projects and got involved in the greenhouse project in the fall 2010 semester when Dabkowski attended Professor Robert Swap's University of Virginia course entitled, "Development on the Ground." This course allowed

students to assemble and collaborate on globally imperative projects. Dabkowski introduced this group of students to the Mongolia greenhouse challenge, which ignited enthusiasm and interest. The group applied for a Jefferson's Public Citizens Grant that was approved and awarded in February of 2011.

"We had to come up with a plan that included all of the parts that you would have to do to secure funding for a project," said Sarah Culver, a fourth-year student in the College who worked on the project. "We came together because we were all interested in rural development as it related

to trash management."

In the spring of 2011, various glass samples were shipped from Mongolia to Charlottesville, Virginia, to test. Under the direction and guidance of Mr. Hess, the students had the opportunity to participate in melting and testing glass samples, as well as welding a test model. The group tested glass-smelting technology and finalized their future plans, which included traveling to Mongolia in June 2011 to build a life-sized, functional greenhouse.

In the Arkhangai province (Aimag), M-CAM partnered with the Hasu Shivert Resort. The resort is almost completely self



sustaining; they produce their own food, energy, water, and shelter, which is almost a necessity in the remote landscape in which it operates, located several hours west of the Mongolian capital of Ulaanbaatar, the coldest capital city in the world. Mongolia, a mostly rural country of about three million situated between Russia and China, has warm summers, but temperatures during the bitterly cold winters often stay well below zero, so the project will hopefully extend the growing season for the Mongolians who on or near the resort site.

In the summer of 2011, Culver, fourth-year global development studies student Claire Cororaton, fourth-year architecture student Carlin Tacey, and R.D. Smith, a

graduate student in civil and environmental engineering, traveled to Hasu Shivert to work on the project. They were joined by Toshi Dekyid, a Tibetan exchange student who had worked on the project in Swap's class, as well as by representatives of M-CAM and other academic and government partner organizations from Tibet and Mongolia.

Greenhouse Construction

Upon arrival, the team spent its first working day at the local market purchasing tools for greenhouse construction. The trip was arduous. Roads in the Mongolian steppe are scarce, and in places are little more than livestock trails, Smith said. "The logistics of the transportation goes back to one of the things we wanted to focus on in our project, which was self-sufficiency," Cororaton said. "And there was tension between being self-sufficient and needing to buy things. We wanted to finish the greenhouse, but we had to confront the question of whether to purchase more stuff so we could finish it or just keep trying to make do with what we had."

Securing wood was another interesting process shaped by cultural norms in Mongolia. They discussed salvaging some



Mongolia At-A-Glance

Did you know?

- Capital City: Ulaanbaatar
- Population: 3 million
- Mongolia is the most sparsely populated independent country in the world. Half of the population is comprised of nomadic people.
- The 6th largest country in Asia, and the 18th largest in the world.
- Due to the extreme continental climate the Mongolian cuisine primarily consists of dairy products, meat, and animal fats. Use of vegetables and spices is limited.
- Coldest month: January
- Average temperature : -35°C
- Warmest month: July
- Average temperature: 25°C
- Mongolian is the native language.
- Russian is the most commonly used foreign language, although both English and Korean are gaining popularity.

www.mongoliatourism.gov.mn

www.m-cam.com

www.virginia.edu/jpc



beetle-infested trees with the Hasu Shivert hosts and decided that it would be ok to cut the infested trees if they first blessed the area. Dabkowski recalls, “We took a bag of rice (which was dyed red), and each of us took a turn taking a handful of rice and throwing it in each of the four cardinal directions (north, east, south, and west). From what we were told, this offering to the land was a gesture of thankfulness for the trees we were going to cut down.”

Kilns, which were shipped from the United States, arrived in Ulaanbaatar, and the team began glass testing and using the glass bottles to create walls for the structure.

The owner of Hasu Shivert had been apprised of the project and had saved some glass from a nearby trash pile to use in the construction. The original plan was to use a small kiln to melt down the glass to make panes, but it didn’t pan out because of unreliable electrical service. Putting their studies and preparation into a real life problem solving situation, the group improvised, developing a stacking system that used the bottles in their original shapes. They relied on hand-made tools in some instances including water levels made from bottles and string—and used a large broken bathtub to pour concrete for the foundation, Swap said.

“They ended up building a nineteen sided, ger-shaped greenhouse,” he said.

Having a group of diverse stakeholders with different aims—and different native languages—added another complication to the construction process beyond what the students had anticipated when drawing up their initial plans, Tacey said. “As a developing designer, you’re taught to make things holistically and to follow a design,” she said. “When you’re collaborating on a project, that’s much more of a challenge. It brings up questions of who makes final decisions and how to best get things done.”

After a month of intensive collaboration, the group finished the greenhouse using cut beetle-infested lumber for the wall structure and various designs for the wall filler, including coal ash insulation. The collaborators hope that the greenhouse will not only help the residents around the resort in providing a place to grow food, but also that the design will spark an interest in greenhouses globally and encourage improvement of the design and sustainable technologies. M-CAM reports that “The head of M-ICP would like to make this design replicable for cities. It is also being used as a model for thinking about cold storage and food logistics in Mongolia.”

Project Collaborators include the Jefferson Public Citizens program at the University of Virginia, Professor Bob Swap from the University of Virginia, M-CAM, Mongolia Innovation Commons Partners (M-ICP), The Mongolian Academy of Sciences, The Economic Policy and Competitiveness Research Center of Mongolia, Elbegdorj Institute (EBI) Think Tank, Hasu Shivert Resort, and Mongolian National Business Incubator Federation.