Mt. Everest biogas digester project aims to treat human waste

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Mount Everest North Face as seen from the path to the base camp, Tibet. Credit: Luca Galuzzi/Wikipedia

"I climbed Mount Everest." This is a boast that some climbers worldwide may think about as the reward for the biggest challenge of a lifetime. For

Nepalese and foreign professionals who work there, getting up and down is not the only issue weighing on their minds. Climbers and adventurous trekkers arrive at the world-famous site and then leave with their memories but the human waste that they leave behind is a problem. The waste is attended to but there is a problem.

As Rachel Nuwer said in *IEEE Spectrum*, "Getting the material off the mountain is one thing; however, properly disposing of it is another." The Mount Everest Biogas Project seeks to address the problem. They aim to convert the human waste from "base camp" into environmentally safe products for the people of Nepal. "Base camps" for Everest and the other peaks in Sagarmatha National Park, Nepal, refer to where the expeditions' climb begins. Camps host climbers for weeks as they prepare. Human waste is being dumped at lower elevations into open pits.

The Biogas Digester is designed to destroy pathogenic fecal coliforms; at the same time it can generate biogas for the local community. The biogas produced by anaerobic digestion, said a report on the project preliminary design, is a mixture of CO2 and methane burning readily and easy to use as cooking and heating fuel.

The project focus is on human waste disposal and treatment for lower-elevation communities. Their solution involves the design of a biogas system that can operate at high altitudes (above 5000 meters / 16,400 feet). Barry Porter is the project manager at the Mt. Everest Biogas Project. Porter and Dan Mazur, a professional mountaineer who lives in Nepal and Tibet for half the year, developed the idea for the project in 2010. "Thousands of biogas reactors already operate at lower altitudes throughout Nepal, but temperatures at Gorak Shep prevent the needed waste-devouring bacteria from thriving. Recognizing this, Mazur asked Porter if he thought it would be possible to create a biogas digester that could function in the cold. Porter did, and the project was born," said

Nuwer in *IEEE Spectrum*.

They call the system the "Mt. Everest Biogas Digester." Under a banner titled "Design Conditions," the report stated that "The microorganisms that produce biogas in BSP digesters require an internal temperature of 68ºF86ºF (2030ºC). No biogas digester has ever been built in an environment as extreme as Gorak Shep, since heat loss from a warm biogas digester into the cold soil surrounding it is unavoidable. Balancing this heat loss, to maintain the digester required temperature, is thus the major obstacle to the success of this project. To replace the lost heat, there must be a sustainable and readily available form of energy for year round operation. In the remote location of Gorak Shep, solar energy is the only plausible solution."

Nuwer's report provides more details about what they have settled on as a solution, after having worked on several iterations.

Every year, 13.23 tons (26,460 lb or 12,000 kg) of human waste solids from the base camps of Mt.Everest, Pumori, Lhotse and Nupste are carried in blue barrels by porters and dumped into open unlined pits at Gorak Shep—this human waste disposal is an environmental hazard because it is potentially contaminating the Gorak Shep water supply and "is considered disrespectful to Sagarmatha by the Sherpa community." (Sagarmatha is the way that Mt. Everest is known in Nepal.)

More information: mteverestbiogasproject.org/